Not to be cited without
permission of the author(s)[1]

Ne pas citer sans
autorisation des auteur(s)[1]

Canadian Atlantic Fisheries
Scientific Advisory Committee

CAFSAC Research Document 87/65

Comité scientifique consultatif des
pêches canadiennes dans d'Atlantique

CSCPCA Document de recherche 87/65

Assessment of the northeastern Gulf of St. Lawrence (Subdiv. 3Pn and Divs. 4RS) cod stock - 1986

by

Alain Fréchet
Direction des sciences biologiques
Institut Maurice Lamontagne
Pêches et Océans
850, route de la Mer
C.P. 1 000
Mont-Joli, (Québec)
G5H 3Z4

[1]This series documents the scientific basis for fisheries management advice in Atlantic Canada. As such, it addresses the issues of the day in the time frames required and the not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

Research Documents are produced in the official language in which they are provided to the Secretariat by author(s).

[1]Cette série documente les bases scientifiques des conseils de gestion des pêches sur la côte atlantique du Canada. Comme telle, elle couvre les problèmes actuels selon les échéanciers voulus et les Documents de recherche qu'elle contient ne doivent pas être considérés comme des énoncés finals sur les sujets traités mais plutôt comme des rapports d'étape sur les études en cours.

Les Documents de recherche sont publiés dans la langue officielle utilisée par les auteur(s) dans le manuscrit envoyé au secrétariat.

ABSTRACT

The decline in the nominal landings of this stock observed since 1983 have continued in 1986. This decrease can be attributed mainly to the failure of the fixed gear fishery. The mobile gear catch rates have slightly decreased since 1981. The biomass estimates from the January 1987 survey and age structure estimates indicate dramatic changes in comparison to results of the eight previous surveys. Part of these changes could be influenced by a warming trend of the bottom waters. The decrease in average length at age for the commercial fishery landings indicate that the removal of fish (in numbers) has been much more important in recent years in order to reach a given TAC.

Results of the analytical assessment of this stock indicate that biomass has reached a historical high in 1983 and has declined slightly afterwards. A projection using present estimates of population size given the current fishing mortality (Ft=0.275) at the target exploitation rate Fo.1=0.2 would result in a catch of 69,000 t for 1988.

RESUME

La chute des débarquements notée pour ce stock depuis 1983 s'est poursuivi en 1986; cette diminution peut être attribuée en majorité à l'échec de la pêche côtière par les engins fixes. Les prises par unités d'effort des chalutiers démontrent une légère diminution depuis 1981. Les résultats de la mission d'évaluation de janvier 1987 indiquent des changements dramatiques pour les estimés de biomasse et la composition à l'âge comparé aux huit missions précédentes. Un réchauffement des eaux profondes pourrait être en partie responsable de ces différences. La diminution de la longueur à l'âge notée récemment dans les débarquements a résulté en une augmentation importante des prises en nombres afin d'atteindre un niveau constant de TPA.

Les résultats de l'évaluation analytique de ce stock indiquent qu'un niveau record de biomasse aurait été atteint en 1983 suivi d'une baisse graduelle. Une projection utilisant l'estimé de population en 1986 à une mortalité par pêche (Ft) de 0.275 suivant le niveau d'exploitation recommandé de Fo.1=0.2 résulte en un capture pour 1988 de 69,000 t.

105-04647/

1. Introduction.

1.1 Description of the fishery.

Since 1977, most of the catches from this stock are from Canadian based vessels except for a 15% allocation for the Saint-Pierre and Miquelon and the metropolitan France fleets. The catches for this stock have ranged 58,060 t in 1959 to 106,080 t in 1983.

This stock is migratory, during winter there is a migration from Division 4R to Subdivision 3Pn and in the spring the stock returns into the Gulf along the west coast of Newfoundland and Quebec north shore. Given this, several gear types are involved in this fishery but vary with time and location. There is an intense winter mobile gear fishery in southern 4R and in 3Pn conducted almost exclusively by Newfoundland based vessels and France (Metropolitan and Saint-Pierre). The summer fishery is prosecuted mainly by Quebec and the West coast of Newfoundland fixed gears in divisions 4R and 4S.

1.2 Nominal catches.

The average annual catch for this stock is 82,608 t (1961-1986) with a minimum value of 58,000 tons in 1972 and a maximum of 106,000 tons in 1983 (Table 1). Since 1979 annual catches have been above that average, except for 1986 (79,886 t). The nominal landings have decreased since 1983 mostly because of shortfalls in the fixed gear component.

A revision of the 1984 nominal landings according to the NAFO statistical bulletin has shown a substantial increase compared to the value reported by Fréchet (1986). This value was 92,822 t compared to the corrected value of 103,643 t. Most of this difference is due to an upward revision of landings for Newfoundland (+9,428 t) and Maritimes (+2,940 t) and to a downward revision of landings for France (-1,603 t).

The purpose of this paper is to provide an update of the status of this cod stock with all available information of the 1986 fishery.

1.3 Anecdotal information.

According to recent discussions with fishermen it seems that the poor performance of the inshore fixed gear fishery experienced since 1983 on the west coast of Newfoundland and along the Quebec north shore has resulted in some redirection of effort toward other species. In the case of Newfoundland fishermen, the abundance (especially in St. George's Bay) and good market prices for winter flounder (black back) have prompted the change from a cod fishery to a winter flounder fishery. Similar reasons have enticed Quebec gillnet fishermen to redirect their effort to the Greenland halibut stock after the closing of the shrimp fishery. Exact quantification of this redirection of effort is difficult to evaluate since no reliable information on fishing effort is available for the fixed gear fishery.

2. Analytical Assessment.

2.1. Input Data.

2.1.1. Nominal Catches.

Data on catch and effort for the 1986 fishery were provided by the statistical offices of the department of Fisheries and Oceans Quebec, Gulf, Scotia-Fundy and Newfoundland regions for the domestic fleet and by the FLASH system for the French fleet catch values and the foreign observer programme for the French fleet effort.

A total of 4,815 t of cod landed on the west coast of Newfoundland could not be provided in time for this document in a disaggregated form (month and gear) and was thus classified as "others" in Tables 1 through 4. Landings from subdivision 3Pn and division 4R in 1986 were mostly made by Newfoundland (75%) whereas landings from division 4S are taken almost exclusively (89%) by Quebec. The decline in fixed gear catches is particularly evident in division 4R (Table 3), the major gears involved being traps, gill nets and hand lines. The winter otter trawl fishery (February to May) in southwestern Newfoundland for 1986 accounts for 23% of all landings and is taken in only 4 months (Table 4).

The fleet allocation scheme and final reported landings since 1980 are shown in Table 5. The reported catches in Table 5 may differ slightly from those in the preceding Tables because they are based on the last weekly quota report of the year while values shown in Tables 1 to 4 are extracted from the NAFO statistical bulletin. The fixed gear fishery has not reached its allocation since 1984 (even with some transfers of quotas from the fixed gear to the mobile gears during the year) whereas the mobile fleet has in spite of those transfers.

2.1.2. Commercial Sampling.

The commercial sampling of this stock in 1986 was done by a number of groups: landings made in Quebec were sampled by the sampling section based in Quebec region, landings made in the Maritimes and west coast of Newfoundland were sampled by the sampling section based in the Gulf region, the French fleet was covered by the International Observer Programme [IOP] based in Halifax and Gaspé; and finally some information was collected at sea by the Quebec Observer Programme. Length frequency and otoliths were collected for major gears present in this fishery (Table 6).

2.1.3. Catches at age.

Calculation of the quarterly catch at age for the mobile (Table 7) and fixed gears (Table 8), and subsequent combination of these to provide a yearly catch at age for the mobile and fixed gears (Table 9) and finally the catch at age for 1986 (Table 10) were obtained with APL*PLUS and the program Catch.aws (Anon., 1986). The length weight relationship used to derive demographic values (in numbers) from nominal landings (in weight) was:

$$\text{Log (weight in gr.)} = -1.98 + 2.96 * \log (\text{length in cm.})$$

(Minet, 1978)

The method of aggregation of length frequency and age length keys to derive the catch at age is similar to that decribed in Fréchet and Gascon (1986). The resulting catch at age, weight at age, length at age and variance of the catch at age for the total, mobile and fixed gear catch were appended to those recently recalculated (Fréchet and Gascon, 1986) (Table 11 through 16). Coefficient of variation for the modal catch in numbers (age 6) was 4%. The 1980 and 1979 year class account for 28 and 21 percent of the total catch at age in 1986. The strong 1977 year class (age 9) is still well represented in the 1986 fishery (11%). The highest proportion of age 9+ fish in the landings was thus reached in 1986 (20%) compared to a minimum value of 5% in 1980 (Table 11).

The length at age from the commercial fishery (Figure 1) still indicates a decrease for most age groups in 1986. This reduction implies a reduction in weight at age as can be seen in Table 12. The impact of this decrease is such that, assuming a constant TAC level, the removal of fish is greater in the recent time period. To illustrate this point, the weights at age for the years 1979-80 when weights at age were high and weights at age for the years 1985-86 when weights at age were low were used with the age composition observed in 1986 to produce estimated removals at age for the corresponding time periods. With a TAC of 100,000 t, 50 million fish would have been removed in 1979-80 while 64 million fish would have been removed in 1985-86. This implies that 28% more fish must be taken now than in 1979-1980 to reach a constant level of TAC.

The modal age class for the mobile gear catch in 1986 is the 1980 year class. In the case of the fixed gear many age classes are well represented (ages 5 to 9). The average weights at age for the fixed gear component have increased between 1985 and 1986 for ages 5 through 11 whereas the mean weights at age in the mobile gear component have decreased.

2.1.4. Commercial Catch Rates.

Catch and effort information since 1959 were standardized using a multiplicative model (Gavaris, 1980) with APL*PLUS and the program Standard.aws (Anon., 1986). Catches of less than 10 t and effort less than 10 hours were deleted because of possible rounding errors. The exceptionally high catch rates recorded by the French fleet in 1984 (22 t/h in February) were deleted from the analysis. The catch and effort values from the Newfoundland based tonnage class [TC] 2 vessels were included in the analysis for the first time as reliable data for this fleet became available and contributed to a large part of the landings.

Results of the ANOVA for the years 1974-86 are shown in Table 17a and results of the ANOVA for the 1959 to 1984 time period were reported by Fréchet (1986). The resulting catch per unit effort [CPUE] shown in Table 17b and Figure 2 indicates a slight decreasing trend since 1981. The amount of effort has decreased since 1984. The large increase in CPUE observed between 1980 and 1981, although influenced by the recruitment of the strong year classes from the late seventies is not considered as an indication of proportionnal increase in stock abundance.

2.1.5. Research Surveys.

Stratified random groundfish surveys have been conducted since 1978 (except for 1982) by the research vessel Gadus Atlantica during the month of January in NAFO divisions 4RST and 3Pn. The stratification scheme used for the surveys is shown in Figure 3. The presence of ice has prevented complete coverage of the survey area, so a selected set of strata is used. The average weight and average number of cod caught per set for these selected strata are shown in Tables 18 and 19.

The January 1987 survey information indicates dramatic changes. The minimum exploitable biomass estimated for the current year is the lowest in the series of 9 years (Figure 4). The estimated numbers at age are shown in Table 20. The 1980 year class which was considered to be strong in previous assessments represents only 10% of the estimated numbers at age in the 1987 survey. A recruitment index based on survey mean number of cod caught per tow at ages 3 and 4 is shown in Table 21. The normalized indices (to the average 1975-77 and 1980-83 values) at age 3 and 4 correlate very poorly and are thus not considered as a good indication of year class strength. The average length at age estimated from these surveys (Figure 5) seems to have levelled off in 1987 (except for ages 4 and 5).

Fish length distribution from the January 1987 survey with a modal length just above 40 cm is much smaller than that of previous surveys (Figure 6). The strong 1977 year class was first detected in January 1979 at a length of 15 cm, and was followed through the various surveys until 1983. It is interesting to note that the modal length from the research surveys match closely that of the commercial fishery for all years available. The shift of the length frequency curve towards smaller fish in 1987 must not be interpreted as a strong recruitment but rather as an absence of larger fish in the surveyed area.

Distribution of the catches were limited to an area off St. Georges Bay and, as was the case in 1986, in Subdivision 3Pn (Figure 7). As stated by Fréchet (1986) this distribution pattern might indicate that the migration was more advanced than in previous years with possible influx into the 3Ps Subdivision. Only two sets of cod catches were over 1 t.

During the winter groundfish surveys, expandable bathytermograph [XBT] casts were made at each set. Temperatures of water near the bottom were plotted and one degree isotherms were drawn. The results (Figure 8) indicate a gradual warming of bottom temperatures in the Gulf. The situation in 1987 was such that most of the survey area is within the 6.0 to 6.9 C range. Although the impact of this warming trend on the results of the surveys or in the commercial CPUE cannot be easily drawn from the available data, the long term results might provide more insights relative to current trends observed for this stock.

2.2. Sequential population analysis [SPA].

Preliminary cohort analyses (Pope,1972) was performed using the catch at age shown in Table 11 and average weights of Table 12. These analyses were done using the program SPA.AWS (Version 5.0 in Anon., 1986). Natural mortality (M) was assumed to be 0.2 for all age groups and all years in the calculations of SPA.

2.2.1. Partial Recruitment.

Full recruitment determined from the partial recruitment matrix (Table 22) was at age 7. The partial recruitment [PR] vector (Table 23) was calculated as the ratio of fishing mortality at age to the fishing mortality of ages 7 to 10 (weighted by population numbers) for the years 1977 to 1984.

A partial recruitment matrix for the mobile gears (Table 24) was calculated by multiplying the F matrix of a preliminary analysis to the age/year specific proportions of catch for those gears (Table 13) to the total catch (Table 11). The resulting matrix indicated full recruitment occurs from age 7 to 9. This matrix was then normalized to the average value calculated for these ages.

2.2.2. Fishing mortality for the oldest age.

Fishing mortality for fish at age 15 is calculated by a weighted (by population numbers) average of fishing mortality of fish for ages 7 to 10 in the same year.

2.2.3. Calibration.

The relationship between mean trawlable biomass versus standardized CPUE based on mobile gear catch and effort data is used for calibration of the SPA. The CPUE data indicate almost a twofold increase between 1980 and 1981 (Table 17b). This increase is not reflected in the results of trawlable biomass from the SPA since these years are now part of the converged part of the matrix. The impact of this forces the relationship between CPUE and mean trawlable biomass to have a significant intercept. The correlation coefficient was previously considered unreliable because the recent observations with high biomass and CPUE were not converged and that any decrease of Ft would result in an increase of the correlation coefficient. The correlation coefficient can now be examined and is maximized at a value of terminal fishing mortality between 0.25 and 0.3 (Table 25a).

In order to eliminate the effect of the high 1981 and 1982 values to the regression of CPUE to mean trawlable biomass, a calibration was done by eliminating these points and determining which value of Ft would result in a zero intercept (Figure 9). This was reached between 0.25 and 0.3 (Table 25b) so the value of 0.275 was considered appropriate as a value for Ft in 1986.

2.2.4. Results.

Although population numbers are stable since 1981, the biomass estimates have reached a peak in 1983 (Table 26). This can be attributed to the presence of the strongest year class observed in the SPA analysis (1977 year class at age 6). Part of the subsequent decrease in total biomass (Table 27) may be attributed to the observed decrease in average weights at age from the commercial sampling. The fishing mortality estimate for 1986 is the lowest in the SPA (Table 28) but fishing mortalities since 1983 are slightly higher. The only exception is the value for 1984 of 0.35 which is influenced by the increase in landings of 11,000 t from previous assessments.

The strong 1980 year class (the second in importance for age 6 fish in the cohort analysis) is still partially recruited (66%) and represents a potential yield in the near future. However, the size of all other year classes since 1978 are close to the historical geometric mean recruitment value of 121 million fish. These year classes are expected to produce average biomass for the projected year 1988.

3. Prognoses.

3.1. Biological information.

A retrospective look of the projections made for the age distribution in the 1986 fishery in Fréchet (1986) to the observed age distribution (Figure 10) indicates good agreement (except for a light shortfall for the observed age 6 fish).

3.2. Catch projections.

Catch projections were done using the 1986 population numbers as estimated by the SPA for Ft=0.275. Recruitment at age 4 for 1987 and 1988 was set at the geometric mean of age 4 numbers for the period 1974 to 1986 (121 million fish). The average of 1984 to 1986 weights at age were used for the projection of biomass.

If the 1987 TAC of 80,300 t is reached, the Fo.1 = 0.2 catch in 1988 would be 69,000 t resulting in a fully recruited fishing mortality of 0.245 for 1987 (Table 29). If the Fo.1 catch of 66,500 t is taken in 1987, the Fo.1 catch in 1988 would be 71,000 t (Table 30).

4. Conclusion.

A number of factors might explain the decrease in landings since 1983. Although the TAC level has gone from 55,000 t in 1977 to 100,000 t in 1984 mostly due to the recruitment of strong year classes from the late 70's, the TAC was overrun for those 8 years. The sum of overruns for those years cumulates to 116,701 t. This will inflate the fishing mortality above the recommended Fo.1 catch level. Results from this assessment indicate that average fishing mortality for that period (0.453) is near Fmax = 0.4.

If the TAC's for the years 1977 to 1984 had not been exceeded, the projected biomass available in 1984 would have been 608,000 t (assuming average partial recruitment, weights at age and recruitment observed for those years) instead of 498,000 t from the current assessment.

Finally the decrease in landings might also be influenced by a change in average weights at age, reasons are unclear. The fixed gear allocation has not been reached since 1983 while the mobile fleet has sustained higher catch rates than those observed during the period from 1959 to 1980.

The only strong year class present in the fishery is the 1980 year class and all other recruiting year classes are close to the historical average. Unless strong year classes appear the future, yield (assuming a constant level of effort) for this stock cannot be expected to exceed the historical average.

5. References.

Anon.. 1986. CAFSAC Assessment Software Catalog. CAFSAC Res. Doc. 86/96: 1-24.

Fréchet, A. 1986. Assessment of the 4RS, 3Pn Cod Stock. CAFSAC Res. Doc. 86/105: 1-60.

Fréchet, A and D. Gascon, 1986. Une nouvelle matrice de capture à l'âge pour le stock de morue des divisions 4R, 4S et 3Pn. CAFSAC Res. Doc. 86/104: 1-33.

Gavaris, S. 1980. Use of multiplicative model to estimate catch rate and effort from commercial data. Can. J. Fish. Aquat. Science, 37:2272-2275.

Minet, J.P., 1978 Dynamics and ,ield assessment of the Northeastern Gulf of St. Lawrence Cod Stock. ICNAF Sel. Paper 3: 7-16.

Pope, J,G. 1972 An investigation of the accuracy of virtual population analysis using COHORT analysis. ICNAF Res. Bull. 9:65-74.

Table 1: 3Pn, 4RS Cod: Historical monthly catch statistics in tons for the period 1961-1986. The pre-1961 data for 3Pn are too incomplete to allow monthly estimate for the stock as a whole.

YEAR	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	NK	TOTAL	TAC
1961 1	364	12,375	44,543	8,745	1,473	5,761	14,341	6,752	2,490	1,408	1,305	453		100,010	
1962 1	316	12,903	24,720	4,656	1,565	6,951	16,717	11,738	3,513	1,535	1,016	291		85,921	
1963 1	649	7,661	13,336	2,478	1,623	17,419	14,870	10,698	3,104	1,916	692	300		74,746	
1964	1,104	24,423	15,761	6,058	3,106	10,350	12,527	5,853	2,153	1,385	863	651		84,234	
1965	792	12,506	21,171	3,698	2,216	5,267	10,422	5,945	3,636	1,359	927	990		68,929	
1966	1,965	22,817	8,929	2,516	1,638	8,371	7,482	4,744	2,490	1,146	1,779	1,208		65,085	
1967	7,872	7,028	14,792	8,447	2,017	7,525	12,664	5,232	7,154	3,315	1,356	1,909	1	79,312	
1968	725	7,980	22,799	9,061	3,087	10,717	17,216	9,400	4,914	1,781	1,172	819		89,671	
1969	875	4,654	9,675	4,220	5,192	10,958	12,103	8,639	7,866	3,557	2,035	1,366		71,140	
1970	1,637	25,487	18,115	27,995	4,803	6,020	8,974	3,897	2,130	3,170	1,936	1,301		105,465	
1971	845	44,590	7,580	5,250	2,338	5,839	8,420	3,039	2,374	1,616	1,004	915		83,810	
1972	1,494	14,961	5,337	7,400	7,334	4,594	6,818	3,296	2,365	1,406	994	212	2,026	58,237	
1973	16,472	10,556	7,586	4,826	3,235	5,860	5,125	4,145	2,365	1,459	1,016	567	2,593	65,805	
1974	12,995	10,753	5,959	5,665	6,231	5,021	6,235	5,396	2,214	1,331	1,009	479	3,148	66,436	
1975	8,232	19,486	2,702	2,616	5,316	5,122	5,042	4,488	2,767	1,267	819	704	1,672	60,233	
1976	15,637	15,204	3,610	3,437	7,071	6,930	6,978	4,310	3,348	2,286	1,537	578	6,055	76,981	
1977	11,143	8,603	3,790	11,312	10,057	7,368	8,133	5,780	3,361	1,751	1,814	454		73,566	55,000
1978	20,754	6,307	5,161	3,156	6,717	9,796	13,255	7,000	2,836	1,979	1,309	236		78,506	55,000
1979	15,543	4,273	6,475	6,647	8,517	12,890	12,085	8,660	2,971	2,449	1,816	451		82,777	75,000
1980	5,280	8,965	9,925	8,087	7,147	14,096	23,158	10,719	5,687	2,773	1,311	431		97,579	75,000
1981	9,156	15,368	3,170	3,763	12,835	17,257	16,344	10,343	5,676	2,550	1,172	277		97,911	75,000
1982	2,289	11,671	10,122	5,544	12,723	16,826	22,492	9,136	8,412	4,463	1,229	32		104,939	93,300
1983	4,152	10,213	11,335	6,251	21,049	18,341	16,228	8,173	5,698	3,956	530	154		106,080	100,000
1984	5,435	10,428	9,008	3,605	12,797	12,883	17,112	10,898	4,504	4,298	802	1,048	4	92,822	100,000
1985 2	1,053	16,945	7,914	4,883	6,446	12,554	13,405	10,832	7,150	2,848	954	1,911		86,895	100,000
1986 2	9,208	10,541	7,719	3,885	10,737	7,072	12,036	5,522	4,072	2,644	693	943	4,815	79,887	92,100
1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80,300

1 Incomplete data. Some statistics for division 3P only.

2 Preliminary statistics

Table 2: 3Pn, 4RS Cod: Historical catch statistics by division.(†).

3Pn	Countries								
Years	CAN-(N)	CAN-(M)	CAN-(Q)	FR-(M)	FR-(SPM)	SPAIN	PORT.	OTHERS	TOTAL
1954									0
1955									0
1956									0
1957									0
1958									0
1959	4,901			651		59	1,162		6,773
1960	5,181		2	3,594		1,428	976		11,281
1961	5,728		42	8,515		15,551	8,282	100	38,218
1962	8,022		3	3,807		9,310	3,506		24,648
1963	8,076		65	2,148		5,764	4,139	12	20,204
1964	8,502			2,015		1,663	2,116	836	15,132
1965	8,344		2	5,206	277	1,466	1,009	431	16,735
1966	6,676		2	3,470	450	1,675	559	592	13,624
1967	4,546			6,622		2,512	1,273	5,475	20,428
1968	5,640			3,207	13	2,223	680	146	11,909
1969	4,763			47	5	102			4,917
1970	4,930			90	1	184			5,205
1971	6,661				26	167	990		7,844
1972	6,521			2,687	3	269	877		10,357
1973	5,885			1,008		515	3,841	51	11,300
1974	2,941		8	3,913	557	1,507	4,149	938	14,013
1975	2,758		18	2,612	295		538	12	6,233
1976	6,041		56	1,452	280			636	8,465
1977	7,109		247	167	42				7,565
1978	6,271		34	497					6,802
1979	10,208	151		557					10,916
1980	8,150	174		271	204				8,799
1981	11,191	60	3	2,869	1,006				15,129
1982	14,703	152		341	289				15,485
1983	12,053	104			4,211				16,368
1984	15,631	74			236				15,941
1985	22,184	555			533				23,282
1986	14,462	197	2	3,423	1,436				19,460

4R	Countries								
Years	CAN-(N)	CAN-(M)	CAN-(Q)	FR-(M)	FR-(SPM)	SPAIN	PORT.	OTHERS	TOTAL
1954			16,571	14,050			1,598	7	32,226
1955	15,611		252	20,642		48	9,628	35	46,234
1956	15,615		4,076	10,568		14	8,737	32	39,062
1957	25,113		1,974	13,512			7,252	1	47,872
1958	18,832		7,139	30,037		314	15,334		71,656
1959	26,089		7,174	7,089		392	166		40,930
1960	17,392		5,937	21,970	4	7,331	13,418	604	66,566
1961	15,737		2,904	18,706		2,374	7,626		47,347
1962	21,984		3,482	7,043		5,451	10,142		48,102
1963	26,799		2,984	1,628		3,019	7,936		42,366
1964	20,152		3,197	16,264	38	6,908	12,492	1	58,960
1965	20,037		1,715	10,084	70	219	11,714		43,839
1966	21,202		1,813	9,735		1,097	10,361		44,208
1967	22,398		3,511	10,460	1	3,806	6,180	3,585	49,941
1968	32,810		4,415	22,963	169	2,779	6,905		70,041
1969	27,342		6,784	16,318	165	2,693	1,330		56,632
1970	23,337		11,337	30,303	120	8,053	17,993	3	91,146
1971	17,095		2,237	24,363	68	5,451	17,144	4	66,362
1972	11,654		3,348	10,608	3	1,357	8,144	2,459	37,583
1973	13,222		1,086	16,525	109	502	11,232	418	43,094
1974	18,348		5,538	11,679	395		5,302	184	39,446
1975	14,897		2,727	13,206	625		9,879	235	41,569
1976	20,004		6,648	15,392	918		9,034	4,034	56,030
1977	9,907		25,568	15,815	2,097				53,387
1978	35,376		6,290	13,252	2,022				56,940
1979	37,098	4,423	1,038	11,040	2,171				55,768
1980	52,358	2,822	582	8,275	646				64,683
1981	48,479	2,291	775	7,466	1,167				61,178
1982	51,248	2,024	882	9,875	1,458				65,487
1983	55,842	3,271	2		7,180				66,295
1984	50,152	1,660	94		11,387				63,293
1985	34,754	1,615	5		7,589				43,963
1986	34,436	1,133	444	7,002	716				43,733

Table 2: (Continued).

4S	Countries							
Years	CAN-(N)	CAN-(M)	CAN-(Q)	FR-(M)	FR-(SPM)	SPAIN	PORT.	OTHERS	TOTAL
1954			2,928						2,928
1955	1		4,487	30			717		5,235
1956	11		2,318	319					2,648
1957	23		5,417	254			119		5,813
1958	157		7,587	38			20		7,812
1959	7		10,224			128			10,357
1960			16,057	18		428			16,503
1961	1		13,814	495		74	81		14,445
1962			13,171						13,171
1963	22		11,794				380		12,176
1964	43		10,077	18			2		10,142
1965	108		7,241				1,006		8,355
1966	88		6,777	57			331		7,253
1967	50		6,859	22			1,092	920	8,943
1968	148		7,558		17				7,721
1969	307		9,241		1	42			9,591
1970	443		8,175			198	298		9,114
1971	182		9,181		1	259		1	9,604
1972	189		9,130	27		338	613		10,297
1973	434		7,942				911	2,124	11,411
1974	388		8,976	88	4		1,474	2,077	12,983
1975	381		7,808	401	18		2,400	1,425	12,431
1976	728		9,231	22	23		1,099	1,383	12,486
1977	171		12,426	10	7				12,614
1978	229		14,535						14,764
1979	47	851	15,194		1				16,093
1980	1,437	1,417	21,243						24,097
1981	336	229	21,038						21,603
1982	141	1,388	22,390	50					23,967
1983	505	1,328	22,385		19				24,237
1984	236	2,409	21,764						24,409
1985	88	774	18,808						19,650
1986	113	1,737	14,844						18,694

4RS,3Pn	Countries								
Years	CAN-(N)	CAN-(M)	CAN-(Q)	FR-(M)	FR-(SPM)	SPAIN	PORT.	OTHERS	TOTAL
1954	0	0	19,499	14,050	0	0	1,598	7	35,154
1955	15,632	0	4,730	20,672	0	48	10,345	35	51,468
1956	13,646	0	6,394	10,887	0	14	8,737	32	41,710
1957	25,156	0	7,301	13,786	0	0	7,371	1	53,885
1958	18,989	0	14,738	30,075	0	314	15,354	0	79,468
1959	31,007	0	17,398	7,750	0	577	1,328	0	58,060
1960	22,483	0	21,996	25,682	4	9,187	14,394	604	94,350
1961	21,468	0	16,780	27,716	0	17,999	15,989	100	100,010
1962	30,006	0	15,658	10,850	0	14,781	13,648	0	85,921
1963	34,887	0	14,843	3,776	0	8,783	12,435	12	74,746
1964	28,709	0	13,274	18,297	38	8,469	14,610	837	84,234
1965	28,489	0	8,938	15,290	347	1,685	13,729	431	68,929
1966	28,166	0	8,592	13,262	450	2,772	11,251	592	65,085
1967	26,984	0	10,370	17,104	1	6,318	8,545	8,980	79,312
1968	38,596	0	11,973	28,170	198	5,002	7,585	146	89,671
1969	32,412	0	18,025	18,365	171	2,837	1,330	0	71,140
1970	28,710	0	19,512	30,393	121	8,435	18,291	3	105,465
1971	23,938	0	11,398	24,383	95	5,877	18,134	5	83,810
1972	18,374	0	12,478	13,322	8	1,984	9,834	2,459	58,237
1973	19,541	0	9,025	17,533	109	1,017	15,984	2,593	65,805
1974	19,653	0	14,522	15,678	958	1,307	10,925	3,199	66,442
1975	18,036	0	10,553	16,219	936	0	12,817	1,672	60,233
1976	28,771	0	15,935	16,866	1,221	0	10,133	8,055	76,981
1977	17,187	0	38,241	15,992	2,146	0	0	0	73,566
1978	41,878	0	20,859	13,748	2,022	0	0	0	78,508
1979	47,351	5,425	16,232	11,597	2,172	0	0	0	82,777
1980	61,945	4,413	21,825	8,348	850	0	0	0	97,379
1981	61,008	2,580	21,816	10,335	2,173	0	0	0	97,910
1982	68,093	3,562	23,272	10,266	1,747	0	0	0	104,939
1983	68,400	4,703	22,387	0	11,410	0	0	0	106,900
1984	66,010	4,143	21,858	0	11,623	0	0	0	103,643
1985	57,016	2,944	16,813	0	8,122	0	0	0	86,895
1986	48,953	3,087	15,290	10,425	2,152	0	0	0	79,887

Table 3: 3Pn, 4RS Cod: Nominal landings by division and gear categories. (DV =dory vessels T =traps GN =gill nets HL =hand lines LL =longlines IN =misc. inshore DS =danish seines PT =pair trawl OT =otter trawl NK =not kno=n.

3Pn	Gears	DV	T	GN	HL	LL	IN. misc.	DS	PT	OT	NK	TOTAL
	1954											0
	1955											0
	1956											0
	1957											0
	1958											0
	1959				1,016		3,885			1,872		6,773
	1960				1,246		3,934			6,101		11,281
	1961					2,083	3,545		15	32,475		38,218
	1962					2,988	5,005		29	16,626		24,648
	1963	53				3,062	4,922			12,167		20,204
	1964	558				3,416	4,875		178	6,105		15,132
	1965	113				2,702	4,815		142	8,963		16,735
	1966	16				2,499	2,854		559	7,596		13,624
	1967					657	3,463	27	33	16,248		20,428
	1968	33				85	5,031	12	306	6,442		11,909
	1969			444	270	3,630	38	10	24	300		4,917
	1970		46	643	675	3,378		5	62	396		5,205
	1971			384	217	5,574	134		52	1,503		7,844
	1972	17	10	181	98	5,593	20	545	178	3,717		10,357
	1973	1,405		175	110	5,431	97	174	356	3,552		11,300
	1974	128		297	52	2,480	915	58	1,507	8,596		14,013
	1975			61	152	2,418	12	6		3,584		6,233
	1976		9	163	225	4,467	636	163		2,802		8,465
	1977		37	73	163	5,679		119		1,494		7,565
	1978		7	34	103	5,323		17		1,318		6,802
	1979		25	40	116	7,338		181		3,216		10,916
	1980			13	83	6,443		18		2,242		8,799
	1981		4	3	72	7,360		28		7,463		15,130
	1982		1	8	87	7,670		12		7,707		15,485
	1983		1	46	97	8,786		20	8	9,146		18,107
	1984		2	129	45	7,089		498		8,177		15,941
	1985		1	37	4	5,804				17,436		23,282
	1986			7	66	5,684		14		13,690		19,461

4R	Gears	DV	T	GN	HL	LL	IN. misc.	DS	PT	OT	NK	TOTAL
	1954						16,413			15,813		32,226
	1955	55					15,620			30,559		46,234
	1956	3,057					15,316			20,589		39,062
	1957	581			196		25,034			22,061		47,872
	1958	2,619			2,281		18,075			48,701		71,656
	1959	2,183			575		25,809			12,363		40,930
	1960				108		17,135			49,323		66,566
	1961					113	15,640	71		31,523		47,347
	1962					104	21,486	105		26,407		48,102
	1963					55	26,620	181		15,510		42,366
	1964					123	18,789	185		39,863		58,960
	1965					152	16,768	145		26,776		43,839
	1966					201	15,532	53	38	28,384		44,208
	1967					207	21,015	47		28,672		49,941
	1968			289		1,138	28,130	60	508	41,916		70,041
	1969		3,943	10,905	1,622	4,405	2,648	198	5	32,908		56,632
	1970	184	2,340	4,319	1,673	5,489	1,962	239	225	74,715		91,146
	1971		3,786	3,718	1,295	3,078	438	247		53,804		66,362
	1972		1,606	2,835	1,107	1,115	2,851	16	24	28,028		37,583
	1973		2,007	3,154	1,007	2,364	3,050	120	84	31,108		43,094
	1974		1,789	5,182	1,714	1,358	666	223		28,514		39,446
	1975		2,032	6,462	1,413	978	490	221		29,973		41,569
	1976		1,572	7,671	1,445	527	4,238	155		40,422		56,030
	1977		2,414	7,866	1,591	1,429	147	147		39,793		53,387
	1978		4,103	13,235	1,749	2,462		233		35,158		56,940
	1979		3,071	11,478	3,138	5,031		311		32,738		55,766
	1980		8,354	11,607	2,380	7,768		467		34,107		64,683
	1981		5,408	5,796	2,096	8,936	327	384		38,231		61,178
	1982		7,473	9,465	2,126	7,208		337		38,878		65,487
	1983		3,415	11,849	5,047	8,614		473		36,347		65,745
	1984		2,899	6,825	2,815	7,311				43,843		63,293
	1985		3,138	4,393	1,668	8,802		315		27,640		43,956
	1986		2,852	4,903	876	4,554		463		25,269	4,815	43,732

Table 3: (Continued).

4S Gears	DV	T	GN	HL	LL	IN. misc.	DS	PT	ST	OT	TOTAL
1954						2,892			36		2,928
1955						4,423			812		5,235
1956						2,197			451		2,648
1957						5,217			596		5,813
1958					107	7,114			591		7,812
1959					434	9,368			555		10,357
1960					5,150	2,037			9,307		16,503
1961		1,133			2,229	3,830	5		7,248		14,445
1962		2,777	80	3,974	2,057		24		4,259		13,171
1963		3,197		3,570	432		15		4,962		12,176
1964					486	6,166			3,490		10,142
1965		3,950	24		320		1		4,060		8,355
1966		1,656	973		441	798			3,385		7,253
1967		2,470	1,618	710	305				3,840		8,943
1968		3,070	1,127	823	333				2,368		7,721
1969		2,312	1,960	607	262				4,450		9,591
1970	21	1,788	846	771	251				5,436		9,114
1971		2,410	983	503	565			1	5,162		9,604
1972		2,040	1,418	511	511				5,817		10,297
1973		885	1,774	470	402	2,248			5,832		11,411
1974		200	2,326	402	976	2,064			7,009		12,977
1975		579	2,072	2,337	136	1,425			5,882		12,431
1976		992	2,900	353	46	1,365			6,810		12,488
1977		861	4,089	303	38		2		7,323		12,614
1978		2,178	3,626	194	28		2		9,736		14,764
1979		1,043	6,578	467	148				7,857		16,093
1980			1,376		1,798	11,658			9,267		24,097
1981		3	384		2,678	12,554		51	5,953		21,603
1982		13	27		3,688	11,629	3	340	8,267		23,967
1983			622	2	3,890	11,245	174		8,295		24,228
1984	8	675	8,923	981	4,301		1,694		7,847		24,409
1985		1,211	6,147	872	4,284				7,132		19,646
1986		52	4,258	380	2,656	9	61		9,258		16,694

3Pn,4RS Gears	DV	T	GN	HL	LL	IN. misc.	DS	PT	OT	WK	TOTAL
1954	0	0	0	0	0	18,305	0	0	15,849	0	35,154
1955	55	0	0	0	0	20,043	0	0	31,371	0	51,469
1956	3,057	0	0	0	0	17,513	0	0	21,140	0	41,710
1957	581	0	0	198	0	30,251	0	0	22,657	0	53,685
1958	2,618	0	0	2,368	0	25,189	0	0	49,292	0	79,468
1959	2,183	0	0	2,025	0	39,062	0	0	14,790	0	58,060
1960	0	0	0	6,513	0	23,108	0	0	64,731	0	94,350
1961	0	1,133	0	0	4,425	23,115	76	15	71,246	0	100,010
1962	0	2,777	80	3,974	5,149	26,491	129	29	47,292	0	85,921
1963	53	3,197	0	3,570	3,548	31,542	198	0	32,639	0	74,746
1964	558	0	0	0	4,025	29,830	185	178	49,458	0	84,234
1965	113	3,950	24	0	3,174	21,581	146	142	39,799	0	68,929
1966	16	1,656	973	0	3,141	19,184	53	567	39,465	0	65,085
1967	0	2,470	1,618	710	1,169	24,478	74	33	48,760	0	79,312
1968	33	3,070	1,416	623	1,556	31,161	72	814	50,926	0	89,671
1969	0	6,255	13,309	2,499	8,297	2,685	208	29	37,858	0	71,140
1970	205	4,175	5,808	3,119	9,118	1,962	244	287	80,547	0	105,465
1971	0	6,198	5,045	2,015	9,215	570	247	53	60,469	0	83,810
1972	17	3,656	4,434	1,716	7,219	2,871	561	200	37,563	0	58,237
1973	1,405	2,892	5,103	1,587	8,387	5,395	294	440	40,292	0	65,805
1974	128	1,988	7,805	2,188	4,794	3,845	281	1,507	44,119	0	66,436
1975	0	2,611	8,595	3,902	3,532	1,927	227	0	39,439	0	60,233
1976	0	2,573	10,734	2,023	5,040	6,259	318	0	50,034	0	76,981
1977	0	3,312	12,028	2,057	7,144	147	288	0	48,610	0	73,586
1978	0	6,288	15,895	2,048	7,813	0	252	0	45,212	0	78,508
1979	0	4,139	18,097	3,721	12,517	0	492	0	43,811	0	82,777
1980	0	8,354	12,908	2,483	18,007	11,658	485	0	45,816	0	97,579
1981	0	5,415	6,183	2,188	18,174	12,881	412	51	51,647	0	97,911
1982	0	7,487	9,500	2,213	18,568	11,629	352	340	54,852	0	104,939
1983	0	3,416	12,517	5,148	17,293	11,245	867	8	55,788	0	106,080
1984	8	3,576	15,677	3,821	18,701	0	2,193	0	59,867	0	103,843
1985	0	4,350	10,577	2,544	16,880	0	315	0	52,208	0	86,884
1986	0	2,904	9,168	1,322	12,894	9	538	0	48,217	4,815	79,867

Table 4a : 3Pn,4RS Cod: Preliminary catch (t) statistics for cod in NAFO Subdivision 3Pn in 1986.

Canada-Newfoundland

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps													0
Fixed gillnets					4	2			1				7
Handlines					20	10	10						40
Line trawls	277	1603	1425	1117	298	208	96	60	304	169	71	56	5684
Danish seines				11			1						12
Otter trawls	186	2760	4674	896	55	1	2	2	3	10	2	68	8659
Others													0
Total	463	4363	6099	2024	377	221	109	62	308	179	73	124	14402

Canada-Maritime

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Fixed gillnets													0
Handlines								25.5					25.5
Danish seines									2				2
Otter trawls		32.3	12.5	4.8	0.9		5.4				0.1	113.9	169.9
Total	0	32.3	12.5	4.8	0.9	0	5.4	25.5	2	0	0.1	113.9	197.4

Canada-Quebec

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps													0
Fixed gillnets													0
Handlines													0
Line trawls													0
Otter trawls					2.3								2.3
Others													0
Total	0	0	0	0	2.3	0	0	0	0	0	0	0	2.3

France

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Otter trawls(M)		3422.9											3422.9
(SP)		531.3	904.9										1436.2
Total	0	3954.2	904.9	0	0	0	0	0	0	0	0	0	4859.1
TOTAL	463	8349.5	7016.4	2028.8	380.2	221	114.4	87.5	310	179	73.1	237.9	19460.8

Table 4b : 3Pn,4RS Cod: Preliminary catch (t) statistics for cod in NAFO division 4R in 1986.

Canada-Newfoundland

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps					8	646	1983	191	24				2852
Fixed gillnets				29	366	976	2732	485	146	38	64	41	4877
Handlines		2		23	42	88	251	359	96	14	1		876
Line trawls	149	1		91	217	516	928	1142	1037	348	93	30	4552
Danish seines				102	234	40	29	17	11	17	11		461
Otter trawls	693	2164	702	966	5740	1047	1994	1662	495	91	126	324	16004
Others													4815
Total	842	2167	702	1211	6607	3313	7917	3856	1809	508	295	395	34437

Canada-Maritime

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Fixed gillnets								0.5					0.5
Handlines													0
Danish seines							2						2
Otter trawls	177.3				375.5	89.2	41.2	151.3	36.9	42.2	14.9	202.4	1130.9
Total	177.3	0	0	0	375.5	89.2	43.2	151.8	36.9	42.2	14.9	202.4	1133.4

Canada-Quebec

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps													0
Fixed gillnets						3.6	21.4	0.4					25.4
Handlines													0
Line trawls						1.9	0.3						2.2
Otter trawls				276.4	129.1	0.6	2.1	5.7	0.4	1.9			416.2
Others													0
Total	0	0	0	276.4	129.1	6.1	23.8	6.1	0.4	1.9	0	0	443.8

France

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Otter trawls(M)	7001.5												7001.5
(SP)	710.1			6									716.1
Total	7711.6	0	0	6	0	0	0	0	0	0	0	0	7717.6

TOTAL	8730.9	2167	702	1493.4	7111.6	3408.3	7984	4013.9	1846.3	552.1	309.9	597.4	43731.8

Table 4c : 3Pn,4RS Cod: Preliminary catch (t) statistics for cod in NAFO division 4S in 1986.

Canada-Newfoundland

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps													0
Fixed gillnets							13						13
Handlines													0
Line trawls										8			8
Danish seines													0
Otter trawls		24				19	4	1		8	1	35	92
Others													0
Total	0	24	0	0	0	19	17	1	0	16	1	35	113

Canada-Maritime

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Fixed gillnets													0
Handlines													0
Danish seines				6	1				26	48			81
Otter trawls	14.6			9	291	105.2	184.3	123	207.5	411.8	240.1	69.5	1656
Total	14.6	0	0	15	292	105.2	184.3	123	233.5	459.8	240.1	69.5	1737

Canada-Quebec

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps						21.2	17.7	1.6	11.3				51.8
Fixed gillnets				100.4	723.4	1086	1494	356.2	301	173.7	7.7	2.8	4245.2
Handlines					2.5	6.3	109.5	121.2	104.8	35.1	0.4		379.6
Line trawls		0.1		18.4	541	407.9	480	434.7	350	383.8	52.4		2648.3
Otter trawls			0.7	229.4	1686.1	1796.8	1625.6	382.5	915.8	864.3	8.3		7509.5
Others							9.8						9.8
Total	0	0.1	0.7	348.2	2953	3318.2	3736.6	1296.2	1682.7	1436.9	68.8	2.8	14844.2

France

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Otter trawls(M)													0
(SP)													0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL	14.6	24.1	0.7	363.2	3245	3442.4	3937.9	1420.2	1916.2	1912.7	309.9	107.3	16694.2

Table 4d : 3Pn,4RS Cod: Preliminary catch (t) statistics for cod in NAFO division 4RS, 3Pn in 1986.

Canada-Newfoundland

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps	0	0	0	0	8	646	1983	191	24	0	0	0	2852
Fixed gillnets	0	0	0	29	370	978	2745	485	147	38	64	41	4897
Handlines	0	2	0	23	62	98	261	359	98	14	1	0	918
Line trawls	426	1604	1425	1208	515	724	1024	1202	1341	525	164	86	10244
Danish seines	0	0	0	113	234	40	30	17	11	17	11	0	473
Otter trawls	879	4948	5376	1862	5795	1067	2000	1665	498	109	129	427	24755
Others	0	0	0	0	0	0	0	0	0	0	0	0	4815
Total	1305	6554	6801	3235	6984	3553	8043	3919	2117	703	369	554	48952

Canada-Maritime

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Fixed gillnets	0	0	0	0	0	0	0	0.5	0	0	0	0	0.5
Handlines	0	0	0	0	0	0	0	25.5	0	0	0	0	25.5
Danish seines	0	0	0	6	1	0	2	0	28	48	0	0	85
Otter trawls	191.9	32.3	12.5	13.8	667.4	194.4	230.9	274.3	244.4	454	255.1	385.8	2956.8
Total	191.9	32.3	12.5	19.8	668.4	194.4	232.9	300.3	272.4	502	255.1	385.8	3067.8

Canada-Quebec

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Traps	0	0	0	0	0	21.2	17.7	1.6	11.3	0	0	0	51.8
Fixed gillnets	0	0	0	100.4	723.4	1089.6	1515.4	356.6	301	173.7	7.7	2.8	4270.6
Handlines	0	0	0	0	2.5	6.3	109.5	121.2	104.6	35.1	0.4	0	379.6
Line trawls	0	0.1	0	18.4	541	409.8	480.3	434.7	350	363.8	52.4	0	2650.5
Otter trawls	0	0	0.7	505.8	1817.5	1797.4	1627.7	388.2	916.2	866.2	8.3	0	7928
Others	0	0	0	0	0	0	9.8	0	0	0	0	0	9.8
Total	0	0.1	0.7	624.6	3084.4	3324.3	3760.4	1302.3	1683.1	1438.8	68.8	2.8	15290.3

France

Gear type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Otter trawls(M)	7001.5	3422.9	0	0	0	0	0	0	0	0	0	0	10424.4
(SP)	710.1	531.3	904.9	6	0	0	0	0	0	0	0	0	2152.3
Total	7711.6	3954.2	904.9	6	0	0	0	0	0	0	0	0	12576.7

TOTAL	9208.5	10540.6	7719.1	3885.4	10736.8	7071.7	12036.3	5521.6	4072.5	2643.8	692.9	942.6	79886.8

Table 5. 3Pn, 4RS Cod: Recent allocation scheme and reported catches (t).

YEAR	FLEET	FINAL ALLOCATION	REPORTED CATCH	%
1980	Mobile >100' NGBV	8800	8589	98
	GBV	1000	1058	106
	Mobile 65-100'	3000	1817	61
	Mobile <65'	22200	27207	123
	Fixed <65'	28000	49349	176
	FRANCE	12000	9133	76
1981	Mobile >100' NGBV	4000	3157	79
	GBV	1000	846	85
	Mobile 65-100'	3000	2550	85
	Mobile <65' 1/1 to 12/7	22500	28948	129
	18/8 to 31/12	3000	3690	123
	Fixed <65'	28000	44720	160
	FRANCE	13500	14089	104
1982	Mobile >100' NGBV	5000	4233	85
	GBV	1000	1106	111
	Mobile 65-100' NGBV	500	333	67
	GBV	2000	2521	126
	Mobile <65' based 4S,4T	6500	4084	63
	based 4R 1/1 to 30/4	7884	7880	100
	1/5 to 31/12	19216	21101	110
	Fixed <65' 1/1 to 30/9	35000	46866	134
	1/10 to 31/12	2000	2264	113
	FRANCE	13500	12160	90
1983	Mobile >100' NGBV	5000	4173	83
	GBV	600	171	29
	Mobile 65-100' NGBV	500	199	40
	groundfish	1000	467	47
	shrimp	1500	1827	122
	Mobile <65' based 4S,4T groundfish	4500	3681	82
	shrimp	2000	1629	81
	based 4R,3Pn groundfish			
	1/1 to 30/4	1677	1677	100
	1/5 to 31/12	4023	4727	117
	based 4R,3Pn shrimp			
	1/1 to 30/4	3705	3705	100
	1/5 to 31/12	7018	7018	100
	based 4R groundfish	8500	9007	106
	based 3P, 4VWX	3800	3815	100
	Fixed <65' 1/1 to 30/9	38500	47666	124
	1/10 to 31/12	2000	1666	83
	FRANCE	13500	12107	90

Table 5. (Continued).

YEAR	FLEET	FINAL ALLOCATION	REPORTED CATCH	%
1984	Mobile >100' NGBV	5000	3171	63
	GBV	600	171	29
	Mobile 65-100' NGBV	500	170	34
	groundfish	800	886	111
	shrimp	2250	1886	84
	Mobile <65' based 4S,4T groundfish	4800	5588	116
	shrimp	1200	1112	93
	overlap	500	535	107
	based 4R	29500	26060	88
	Fixed <65' 1/1 to 30/9	38107	37073	97
	1/10 to 31/12	3243	2858	88
	FRANCE	13500	13224	98
1985	Mobile >100' NGBV	4944	3270	66
	GBV	1056	386	37
	Mobile 65-100' NGBV	500	179	36
	groundfish	1700	1561	92
	shrimp	1500	1306	87
	Mobile <65' based 4S,4T groundfish	5500	5195	94
	shrimp	1800	1071	60
	overlap	500	473	95
	based 4R	30500	28910	95
	Fixed <65' 1/1 to 30/9	36500	34551	95
	1/10 to 31/12	2000	1149	57
	FRANCE	13500	8122	60
1986	Mobile >100' NGBV	4160	3524	85
	GBV	1240	1112	90
	Mobile 65-100' NGBV	400	449	112
	groundfish	1700	1456	86
	shrimp	1400	1530	109
	Mobile <65'	27850	26616	96
	based 4S,4T groundfish			
	1/1 to 30/4	1000	1077	108
	1/5 to 31/12	4850	5059	104
	shrimp	1500	1539	103
	overlap	500	505	101
	Fixed <65' 1/1 to 30/9	32000	23205	73
	1/10 to 31/12	2000	1437	72
	FRANCE	13500	12577	93

NOTE: NGBV = Non Gulf Based Vessels GBV = Gulf Based Vessels

Table 6 : 3Pn, 4RS Cod: commercial sampling in 1986.

Gear *	Quarter	Country	Division	Length Measurements	Otoliths
OTB	1	CAN(N)	3Pn	1001	120
			4R	11533	399
		FRA	3Pn	12860	262
			4R	7710	137
	2	CAN(N)	4R	7296	350
		CAN(Q)	4R	751	105
			4S	2520	209
	3	CAN(N)	4R	3226	325
		CAN(Q)	4S	3328	203
	4	CAN(Q)	4S	322	
ST	2	CAN(Q)	4S	2419	294
	3	CAN(N)	4R	511	75
		CAN(Q)	4S	2968	340
		CAN(M)	4S	1038	51
	4	CAN(Q)	4S	1256	90
		CAN(M)	4S	776	89
LL	1	CAN(N)	3Pn	2784	462
	2	CAN(N)	3Pn	3579	450
			4R	841	211
		CAN(Q)	4S	1967	368
	3	CAN(N)	3Pn	304	64
			4R	1195	291
		CAN(Q)	4S	3746	405
	4	CAN(Q)	4S	622	88
GN	2	CAN(N)	4R	2955	376
		CAN(Q)	4S	1576	192
	3	CAN(N)	4R	2051	329
		CAN(Q)	4S	1603	230
	4	CAN(Q)	4S	131	29
FIX	2	CAN(N)	4R	257	27
LMP	3	CAN(N)	4R	316	33
		CAN(Q)	4S	754	129
TOTAL				84174	6733

* OTB = otter trawl ST = shrimp trawl LL = long line
FIX = cod traps LMP = hand lines

Table 7: 3Pn, 4RS Cod. Quarterly catch at age for the mobile gear in 1986.

Quarter 1

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH ('000) MEAN	CATCH ('000) STD. ERR.	CATCH ('000) C. V.
2	0.357	34.000	7	7.70	1.18
3					
4	0.568	39.582	327	57.18	0.17
5	0.852	45.263	1888	239.49	0.13
6	1.076	48.993	5264	406.95	0.08
7	1.304	52.207	5094	443.69	0.09
8	1.673	56.629	1996	278.42	0.14
9	1.995	60.111	1802	223.01	0.12
10	2.153	61.233	481	132.28	0.27
11	1.953	59.495	622	168.80	0.27
12	2.565	65.333	52	28.40	0.55
13	2.809	66.830	51	28.65	0.56
14	6.254	86.546	4	2.75	0.64
15	5.966	88.000		0.40	1.08
16	5.966	88.000		0.40	1.08

TOTAL CATCH: 24018t.

Quarter 2

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH ('000) MEAN	CATCH ('000) STD. ERR.	CATCH ('000) C. V.
4	0.686	42.252	128	29.29	0.23
5	1.022	48.204	1918	171.73	0.09
6	1.165	50.407	3574	212.54	0.06
7	1.467	54.348	2010	176.22	0.09
8	1.743	57.409	914	117.12	0.13
9	1.948	59.543	1278	123.18	0.10
10	2.167	61.953	491	69.14	0.14
11	2.436	63.949	239	46.51	0.19
12	2.514	65.034	100	26.31	0.26
13	2.301	63.149	48	21.46	0.45
14	6.584	89.464	4	1.69	0.44
15	2.662	67.000	3	3.31	1.00
16	4.840	82.000	1	1.03	1.04
17					
18	4.840	82.000	1	1.03	1.04

TOTAL CATCH: 14120t.

Quarter 3

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH ('000) MEAN	CATCH ('000) STD. ERR.	CATCH ('000) C. V.
3	0.729	43.186	47	18.23	0.39
4	0.826	44.863	675	62.84	0.09
5	1.040	48.403	1424	92.50	0.06
6	1.350	52.716	1589	94.82	0.06
7	1.691	56.730	677	65.07	0.10
8	2.097	60.944	418	44.38	0.11
9	2.549	64.917	387	36.66	0.09
10	2.911	68.022	133	19.54	0.15
11	2.847	67.028	87	16.99	0.20
12	5.499	82.724	18	6.45	0.36
13	5.744	84.729	4	2.14	0.49
14					
15	12.151	112.000	2	1.65	1.06

TOTAL CATCH: 7902t.

Quarter 4

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH ('000) MEAN	CATCH ('000) STD. ERR.	CATCH ('000) C. V.
3	0.610	40.693	108	46.69	0.45
4	0.700	42.441	491	77.66	0.16
5	1.069	48.815	624	87.38	0.14
6	1.292	52.028	469	76.74	0.16
7	1.479	54.243	350	68.03	0.19
8	1.907	59.323	129	35.49	0.27
9	2.223	62.631	158	31.28	0.20
10	2.023	60.747	39	18.49	0.47
11	2.051	60.996	17	11.83	0.70
12	2.662	67.000	4	3.74	1.01

TOTAL CATCH: 2710t.

Table 8: 3Pn, 4RS Cod. Quarterly catch at age for fixed gear in 1986.

Quarter 1

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH('000) MEAN	CATCH('000) STD. ERR.	C. V.
3	0.530	38.780	7	3.32	0.50
4	0.663	41.762	60	10.43	0.17
5	1.027	47.895	139	24.08	0.17
6	1.274	51.774	393	39.59	0.10
7	1.824	58.344	219	35.67	0.16
8	2.159	61.584	228	34.48	0.15
9	2.409	63.357	302	37.16	0.12
10	2.822	67.146	146	24.00	0.16
11	2.918	67.704	88	19.16	0.22
12	2.810	66.214	52	17.06	0.33
13	3.592	71.726	13	7.74	0.58
14	7.564	93.033	4	2.00	0.46
15	12.181	112.000		0.37	1.48
16	8.710	100.000	1	0.85	1.07
17					
18	8.710	100.000	1	0.85	1.07
19					
20					
21	12.181	112.000		0.37	1.48

TOTAL CATCH: 3455t

Quarter 2

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH('000) MEAN	CATCH('000) STD. ERR.	C. V.
3	0.578	40.000	1	0.88	1.00
4	0.860	45.355	30	6.54	0.22
5	1.084	48.934	185	18.52	0.10
6	1.435	53.775	581	35.52	0.06
7	1.904	59.156	522	38.22	0.07
8	2.385	63.679	555	38.07	0.07
9	2.580	65.030	642	39.03	0.06
10	2.886	67.347	233	24.25	0.10
11	3.040	68.374	223	23.85	0.11
12	3.293	69.999	76	12.97	0.17
13	3.888	73.825	35	7.36	0.21
14	4.664	79.299	12	3.42	0.28
15	5.666	84.823	2	1.28	0.59
16	10.202	104.851	2	0.82	0.40
17	8.269	96.798	2	0.89	0.54
18	4.876	80.205	3	1.52	0.56
19					
20	12.891	113.682	1	0.39	0.37
21					
22					
23	23.085	139.000			0.01

TOTAL CATCH: 6898t

Quarter 3

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH('000) MEAN	CATCH('000) STD. ERR.	C. V.
3	0.636	41.266	45	19.81	0.44
4	0.775	43.906	441	53.60	0.12
5	1.006	47.667	990	73.87	0.07
6	1.420	53.224	1749	93.49	0.05
7	1.916	58.862	1257	79.90	0.06
8	2.312	62.807	897	64.18	0.07
9	2.667	65.782	867	59.63	0.07
10	2.912	67.583	428	43.43	0.10
11	3.320	70.764	310	33.49	0.11
12	3.038	68.520	97	19.96	0.20
13	4.033	75.973	27	7.65	0.28
14	4.448	79.392	13	4.75	0.37
15	7.004	91.827	4	2.47	0.57
16					
17					
18					
19					
20	4.840	82.000	2	1.70	1.01

TOTAL CATCH: 13690t

Quarter 4

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH('000) MEAN	CATCH('000) STD. ERR.	C. V.
4	0.716	43.000	1	1.58	1.10
5	1.579	55.588	46	23.09	0.50
6	1.863	58.725	100	27.02	0.27
7	2.157	61.810	82	20.95	0.26
8	2.678	66.605	147	34.97	0.24
9	2.486	64.472	165	38.67	0.23
10	2.206	62.348	48	25.20	0.53
11	2.903	68.435	59	21.29	0.36
12	3.000	69.426	23	12.26	0.54
13	8.443	98.398	1	0.62	1.07
14	6.588	91.000		0.42	1.42
15	7.252	94.000		0.31	1.42
16					
17					
18	4.840	82.000	1	1.03	1.07
19	10.249	106.000		0.46	1.60

TOTAL CATCH: 1569t

Table 9: 3Pn, 4RS Cod. Catch at age for the mobile (a) and fixed gear (b) catch in 1986.

a)

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH('000) MEAN	STD. ERR.	C. V.
2	0.357	34.000	7	8.46	1.18
3	0.646	41.449	170	57.14	0.34
4	0.725	42.859	1782	130.54	0.07
5	0.977	47.369	6434	352.77	0.05
6	1.154	50.131	11976	522.07	0.04
7	1.384	53.200	8936	534.79	0.06
8	1.751	57.458	3799	337.78	0.09
9	2.048	60.534	3984	284.95	0.07
10	2.243	62.313	1256	166.68	0.13
11	2.155	61.301	1059	193.77	0.18
12	2.842	67.001	191	43.33	0.23
13	2.697	65.880	113	39.41	0.35
14	6.409	87.918	9	3.55	0.40
15	5.694	81.718	6	4.09	0.71
16	5.147	83.632	1	1.22	0.81
17					
18	4.840	82.000	1	1.13	1.04

TOTAL CATCH: 53577t.

b)

AGE	AVERAGE WEIGHT(kg)	AVERAGE LENGTH(cm)	CATCH('000) MEAN	STD. ERR.	C. V.
3	0.622	40.934	54	20.65	0.38
4	0.767	43.742	547	56.52	0.10
5	1.038	48.132	1397	85.41	0.06
6	1.418	53.329	2900	113.92	0.04
7	1.913	58.997	2137	103.11	0.05
8	2.344	63.226	1877	91.76	0.05
9	2.584	65.058	2030	91.62	0.05
10	2.850	67.155	888	62.41	0.07
11	3.140	69.382	698	51.47	0.07
12	3.084	68.574	256	32.66	0.13
13	3.922	74.406	78	13.51	0.17
14	5.010	81.446	31	6.37	0.21
15	6.777	90.420	7	2.90	0.41
16	9.788	103.506	3	1.22	0.41
17	8.269	96.798	2	0.91	0.54
18	5.551	84.116	5	2.08	0.45
19	10.349	106.000		0.47	1.60
20	7.908	94.072	3	1.79	0.64
21	12.181	112.000		0.38	1.48
22					
23	23.085	139.000			0.01

TOTAL CATCH: 26309t.

Table 10: 3Pn, 4RS Cod. Catch at age, average weights, lengths and variance in 1986.

	AVERAGE		CATCH('000)		
AGE	WEIGHT(kg)	LENGTH(cm)	MEAN	STD. ERR.	C. V.
2	0.357	34.000	7	8.46	1.18
3	0.640	41.325	225	60.76	0.27
4	0.735	43.066	2329	142.25	0.06
5	0.988	47.505	7831	362.97	0.05
6	1.206	50.754	14876	534.36	0.04
7	1.486	54.319	11072	544.64	0.05
8	1.947	59.365	5676	350.02	0.06
9	2.229	62.061	6014	299.32	0.05
10	2.494	64.318	2145	177.98	0.08
11	2.546	64.512	1757	200.49	0.11
12	2.981	67.902	447	54.26	0.12
13	3.198	69.364	191	41.66	0.22
14	5.325	82.906	40	7.29	0.18
15	6.296	86.553	13	5.01	0.39
16	8.224	96.807	4	1.72	0.39
17	8.269	96.798	2	0.91	0.54
18	5.415	83.710	6	2.37	0.42
19	10.349	106.000		0.47	1.60
20	7.908	94.072	3	1.79	0.64
21	12.181	112.000		0.38	1.48
22					
23	23.085	139.000			0.01

TOTAL CATCH: 79886t.

Table 11: 3Pn, 4RS Cod: Catch at age('000)

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 I	0	0	0	0	0	0	0	0	0	0	0	0	0
2 I	0	12	3	0	0	0	1	2	12	116	0	7	7
3 I	741	35	217	14	61	70	605	316	229	840	47	153	225
4 I	4069	4313	5210	2672	2678	3404	3390	6689	3231	4901	2947	2437	2329
5 I	9607	7707	12535	10124	10794	13995	17515	8999	18782	15255	7733	15227	7831
6 I	13498	5091	6323	12756	17616	12871	20196	20054	12747	18451	13493	13225	14876
7 I	5303	7185	4244	7943	9292	12592	11624	13971	13768	10206	20246	10367	11072
8 I	6658	2930	5750	2628	2163	4822	7064	4730	8673	6002	7394	9679	5676
9 I	2794	2757	1991	3274	1064	1429	1531	2154	3372	3061	5688	3148	6014
10 I	1509	1719	2561	1098	1261	721	483	939	2109	1161	2095	2307	2145
11 I	413	740	993	894	538	543	289	294	618	817	821	844	1757
12 I	173	316	395	394	441	300	324	172	145	211	406	205	447
13 I	82	135	147	291	235	141	77	163	74	214	145	86	191
14 I	31	89	69	84	128	88	78	74	42	32	40	15	40
15 I	23	28	45	20	27	29	30	71	24	20	20	16	13
16 I	32	16	6	22	11	21	18	44	13	17	36	6	4
17 I	3	5	0	16	5	5	9	25	14	25	8	3	2
18 I	6	5	3	7	6	0	2	9	7	2	4	4	6
19 I	0	0	0	2	0	2	3	0	1	1	3	0	0
20 I	0	5	0	2	0	2	1	0	1	1	1	0	3
21 I	0	0	0	5	0	1	0	0	0	0	0	0	0
22 I	0	0	0	0	1	0	0	0	0	0	0	0	0
23 I	0	0	0	0	0	0	0	0	0	0	1	0	0
24 I	0	0	0	0	0	0	1	0	0	0	0	0	0

Table 12: 3Pn, 4RS Cod: Mean weight at age(kg)

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 I	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2 I	.00	.06	.20	.00	.00	.00	.27	.32	.12	.13	.00	.38	.36
3 I	.46	.40	.44	.46	.57	.35	.51	.57	.45	.38	.42	.62	.64
4 I	.64	.72	.76	.65	.75	.65	.62	.79	.85	.93	.79	.78	.73
5 I	.99	1.00	1.13	1.02	.96	.93	.93	.98	1.11	1.30	1.03	.98	.99
6 I	1.31	1.52	1.68	1.48	1.44	1.42	1.43	1.32	1.44	1.60	1.45	1.23	1.21
7 I	1.67	1.89	2.15	2.02	1.98	1.87	1.91	1.85	1.76	1.90	1.77	1.63	1.49
8 I	1.98	2.34	2.60	2.52	2.63	2.58	2.41	2.49	2.12	2.18	2.03	1.94	1.95
9 I	2.51	2.61	2.90	2.77	3.22	3.40	3.41	3.34	2.66	2.45	2.30	2.18	2.23
10 I	2.89	3.08	3.11	3.17	3.32	3.84	4.15	4.55	3.13	3.47	2.70	2.37	2.49
11 I	4.46	4.16	3.91	3.35	3.22	3.96	4.41	6.04	3.88	4.52	3.48	2.66	2.55
12 I	5.59	4.50	4.83	4.23	3.86	5.23	3.87	7.43	5.70	4.37	3.75	3.81	2.98
13 I	5.57	4.30	6.90	4.13	5.12	5.38	5.42	5.93	6.02	6.66	4.70	4.74	3.20
14 I	6.61	6.56	5.26	4.48	5.90	5.37	4.17	7.96	6.41	5.94	7.88	7.47	5.33
15 I	8.64	6.53	7.40	8.08	7.34	6.25	7.93	5.34	6.04	6.68	8.26	8.57	6.30
16 I	7.81	5.02	9.86	9.57	6.48	7.28	5.19	8.94	7.32	6.19	7.02	9.51	8.22
17 I	5.97	3.43	.00	13.14	6.67	7.36	6.04	12.42	7.46	5.64	7.50	9.33	8.27
18 I	12.22	9.51	8.71	7.51	5.69	.00	15.21	9.48	11.00	6.00	14.57	9.98	5.41
19 I	.00	.00	.00	5.97	.00	3.87	8.96	7.96	15.31	15.39	14.29	16.46	10.35
20 I	.00	9.51	.00	4.84	.00	11.63	17.67	8.07	13.87	14.17	12.21	9.51	7.91
21 I	.00	.00	.00	10.35	.00	16.46	.00	.00	.00	.00	20.29	26.16	12.18
22 I	.00	.00	.00	.00	15.31	.00	.00	.00	.00	.00	.00	9.51	.00
23 I	.00	.00	.00	.00	.00	16.46	.00	.00	.00	.00	24.76	.00	23.08
24 I	.00	.00	.00	.00	.00	.00	18.94	.00	.00	18.94	.00	.00	.00

Table 13: 3Pn, 4RS Cod: Catch at age [mobile gear] ('000)

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 I	0	0	0	0	0	0	0	0	0	0	0	0	0
2 I	0	12	3	0	0	0	0	0	12	116	0	4	7
3 I	53	35	217	13	12	39	38	32	219	729	6	89	170
4 I	1240	4294	5202	2309	1421	1712	794	3922	1665	2103	1411	1853	1782
5 I	4618	7653	12290	7949	7101	8191	7487	6749	12565	9103	4268	10972	6434
6 I	9531	4466	5392	9364	13019	8661	10784	15204	7350	11078	9055	8557	11976
7 I	4087	5853	2689	5243	5732	8240	6245	8063	8406	5936	13715	6333	8936
8 I	5482	1629	3411	1608	968	2411	3620	2785	4631	3521	4542	6197	3799
9 I	2078	1692	798	2085	415	616	578	824	1405	1681	3316	1800	3984
10 I	1183	956	1092	814	651	209	221	275	535	360	962	1265	1256
11 I	201	195	420	628	353	253	119	34	82	218	316	354	1059
12 I	132	131	171	253	219	109	163	31	59	33	199	68	191
13 I	64	69	49	199	78	45	41	12	11	20	61	17	113
14 I	16	22	15	57	74	33	55	5	8	4	14	1	9
15 I	17	18	9	1	15	7	14	17	11	3	8	1	6
16 I	32	16	2	17	6	4	5	4	0	8	16	1	1
17 I	0	5	0	11	3	3	5	2	4	0	0	1	0
18 I	0	0	0	7	6	0	0	0	2	0	1	1	1
19 I	0	0	0	2	0	2	0	0	0	0	0	0	0
20 I	0	0	0	2	0	0	1	0	1	0	0	0	0
21 I	0	0	0	5	0	0	0	0	0	0	0	0	0
22 I	0	0	0	0	0	0	0	0	0	0	0	0	0
23 I	0	0	0	0	0	0	0	0	0	0	0	0	0
24 I	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 14: 3Pn, 4RS Cod: Mean weight at age [mobile gear] (Kg)

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 I	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2 I	.00	.06	.20	.00	.00	.00	.00	.00	.12	.13	.00	.34	.36
3 I	.36	.40	.44	.46	.26	.28	.42	.38	.45	.36	.51	.58	.65
4 I	.66	.72	.76	.65	.70	.59	.65	.77	.74	1.05	.86	.76	.72
5 I	1.01	1.00	1.12	1.03	.91	.92	.95	.94	1.09	1.38	1.09	.98	.98
6 I	1.30	1.42	1.58	1.43	1.34	1.33	1.37	1.26	1.34	1.58	1.46	1.22	1.15
7 I	1.64	1.75	1.94	1.87	1.80	1.71	1.82	1.60	1.71	1.79	1.73	1.56	1.38
8 I	1.90	1.96	2.36	2.28	2.41	2.17	2.19	1.99	2.05	1.96	1.96	1.84	1.75
9 I	2.37	2.23	2.51	2.56	2.80	2.77	3.13	2.37	2.52	2.09	2.18	2.04	2.05
10 I	2.57	2.45	2.84	3.08	2.86	3.21	3.64	3.02	3.43	2.75	2.48	2.15	2.24
11 I	4.43	3.59	3.21	3.14	2.72	3.01	3.60	4.31	4.46	3.07	3.33	2.33	2.16
12 I	5.36	3.01	4.00	4.03	3.40	3.38	3.50	4.68	5.13	5.28	3.47	3.43	2.84
13 I	5.02	3.44	5.93	4.16	4.01	4.16	4.68	6.02	5.42	7.80	3.74	4.75	2.70
14 I	6.29	4.55	4.37	4.41	3.85	3.86	3.70	5.90	3.98	6.49	9.42	10.12	6.41
15 I	8.59	5.71	3.73	8.80	7.71	5.06	6.20	4.01	6.08	7.40	9.76	6.70	5.69
16 I	7.81	5.02	13.16	9.13	6.06	4.04	5.36	5.02	.00	5.93	5.17	16.46	5.15
17 I	.00	3.43	.00	15.86	6.29	6.30	6.76	5.47	5.97	18.94	.00	6.52	.00
18 I	.00	.00	.00	7.33	5.39	.00	.00	.00	6.92	.00	13.86	3.88	4.84
19 I	.00	.00	.00	5.97	.00	3.87	10.35	.00	.00	13.17	.00	.00	.00
20 I	.00	.00	.00	4.84	.00	14.22	17.67	12.18	16.46	.00	.00	.00	.00
21 I	.00	.00	.00	10.35	.00	.00	.00	.00	.00	.00	.00	.00	.00
22 I	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
23 I	.00	.00	.00	.00	.00	16.46	.00	.00	.00	.00	.00	.00	.00
24 I	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

Table 15: 3Pn, 4RS Cod: Catch at age [fixed gear] ('000)

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 I	0	0	0	0	0	0	0	0	0	0	0	0	0
2 I	0	0	0	0	0	0	1	2	0	0	0	3	0
3 I	688	0	0	1	48	31	566	283	10	111	40	64	54
4 I	2829	19	8	364	1223	1692	2596	2767	1566	2797	1536	584	547
5 I	4990	53	245	2175	3555	5804	10028	2250	6217	6152	3465	4254	1397
6 I	3968	626	931	3392	4372	4211	9412	4851	5398	7373	4438	4668	2900
7 I	1216	1332	1555	2700	3442	4352	5379	5909	5362	4270	6531	4034	2137
8 I	1175	1300	2339	1021	1167	2411	3443	1944	4042	2481	2852	3482	1877
9 I	716	1064	1193	1189	635	813	953	1330	1967	1381	2373	1348	2030
10 I	326	763	1469	284	594	513	262	664	1574	801	1134	1042	888
11 I	212	545	573	265	178	290	170	261	536	598	505	489	698
12 I	41	185	224	141	216	191	161	142	86	178	206	137	256
13 I	17	65	98	92	154	96	36	151	64	194	84	69	78
14 I	15	67	54	27	52	54	23	69	33	28	26	13	31
15 I	6	10	35	19	11	22	17	54	13	17	12	14	7
16 I	0	0	4	5	5	16	13	40	13	9	20	5	3
17 I	3	0	0	5	1	3	4	23	10	25	8	2	2
18 I	6	5	3	1	1	0	2	9	5	2	3	3	5
19 I	0	0	0	0	0	0	3	0	1	0	3	0	0
20 I	0	5	3	0	0	1	0	0	0	1	1	0	3
21 I	0	0	0	0	0	1	0	0	0	0	0	0	0
22 I	0	0	0	0	1	0	0	0	0	0	0	0	0
23 I	0	0	0	0	0	0	0	0	0	0	1	0	0
24 I	0	0	0	0	0	0	1	0	0	0	0	0	0

Table 16: 3Pn, 4RS Cod: Mean weight at age [fixed gear] (kg)

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 I	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2 I	.00	.00	.00	.00	.00	.00	.27	.32	.00	.00	.00	.43	.00
3 I	.47	.00	.00	.46	.65	.43	.51	.59	.43	.51	.41	.67	.62
4 I	.63	.91	.58	.66	.81	.70	.61	.81	.95	.84	.72	.83	.77
5 I	.97	1.10	1.71	.98	1.08	.96	.91	1.09	1.15	1.18	.95	.98	1.04
6 I	1.34	2.22	2.22	1.60	1.73	1.62	1.51	1.53	1.58	1.64	1.42	1.25	1.42
7 I	1.77	2.53	2.52	2.31	2.28	2.16	2.02	2.19	1.84	2.04	1.87	1.73	1.91
8 I	2.39	2.81	2.95	2.90	2.81	3.00	2.65	3.21	2.21	2.48	2.14	2.14	2.34
9 I	2.91	3.21	3.16	3.14	3.49	3.88	3.59	3.94	2.76	2.89	2.46	2.38	2.58
10 I	4.04	3.87	3.32	3.44	3.83	4.09	4.58	5.18	3.03	3.80	2.89	2.62	2.85
11 I	4.49	4.36	4.43	3.84	4.20	4.79	4.97	6.26	3.79	5.04	3.58	2.90	3.14
12 I	6.32	5.55	5.46	4.59	4.33	6.28	4.25	8.02	6.09	4.20	4.02	4.00	3.08
13 I	7.64	5.21	7.39	4.07	5.68	5.94	6.26	5.92	6.12	6.54	5.40	4.74	3.92
14 I	6.96	7.22	5.51	4.64	8.81	6.29	5.29	8.11	7.02	5.85	7.03	7.20	5.01
15 I	8.78	7.96	8.34	8.05	6.81	6.65	9.35	5.76	6.01	6.54	7.35	8.75	6.78
16 I	.00	.00	7.96	11.03	7.03	8.12	5.11	9.37	7.32	6.40	8.49	8.71	9.79
17 I	5.97	.00	.00	6.46	7.63	8.40	5.29	12.98	8.09	5.51	7.50	11.28	8.27
18 I	12.22	9.51	8.71	9.16	7.96	.00	15.21	9.48	13.11	6.00	14.95	12.61	5.55
19 I	.00	.00	.00	.00	.00	.00	8.90	7.96	15.31	24.59	14.29	16.46	10.35
20 I	.00	9.51	8.71	.00	.00	11.24	.00	7.33	6.59	14.17	12.21	9.51	7.91
21 I	.00	.00	.00	.00	.00	16.46	.00	.00	.00	.00	20.29	26.16	12.18
22 I	.00	.00	.00	.00	15.31	.00	.00	.00	.00	.00	.00	9.51	.00
23 I	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	24.76	.00	23.08
24 I	.00	.00	.00	.00	.00	.00	18.94	.00	.00	18.94	.00	.00	.00

TABLE 17a: 3Pn, 4RS COD RESULTS OF THE ANOVA FROM THE REGRESSION OF LN CATCH RATES AGAINST DUMMY CATEGORICAL VARIABLES

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... .853
MULTIPLE R SQUARED..... .728

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	1.229E0002	1.229E0002	
REGRESSION	34	4.778E0002	1.405E0001	49.184
TYPE 1	9	9.372E0001	1.041E0001	36.449
TYPE 2	11	1.166E0001	1.060E0000	3.712
TYPE 3	2	4.451E0000	2.225E0000	7.789
TYPE 4	12	6.548E0001	5.457E0000	19.099
RESIDUALS	626	1.788E0002	2.857E-001	
TOTAL	661	7.795E0002		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
1	6	INTERCEPT	-0.584	0.135	661
2	1				
3	1				
4	1974				
1	2	1	0.337	0.087	74
	3	2	0.797	0.085	75
	4	3	-0.139	0.156	20
	5	4	0.423	0.148	24
	7	5	0.437	0.091	58
	8	6	-0.967	0.121	74
	9	7	-0.581	0.110	114
	10	8	0.996	0.132	24
	11	9	0.540	0.084	105
2	2	10	0.006	0.084	118
	3	11	-0.131	0.096	70
	4	12	-0.121	0.090	96
	5	13	-0.267	0.093	101
	6	14	-0.374	0.121	44
	7	15	-0.371	0.132	35
	8	16	-0.517	0.136	32
	9	17	-0.557	0.131	34
	10	18	-0.575	0.137	29
	11	19	-0.491	0.135	25
	12	20	-0.472	0.181	11
3	2	21	0.214	0.070	330
	3	22	0.013	0.092	244

Type 1: Fleets

Code	Province	TC
2	Maritime	4
3	"	5
4	Newfoundland	2
5	"	3
6	"	4
7	"	5
8	Quebec	2
9	"	3
10	"	4
11	France	5

Type 2: Months

Type 3: Areas

Code	Area
1	3Pn
2	4R
3	4S

Type 4: Years

Table17b: 3Pn, 4RS Cod. Mean catch rate values (t/h)
The standard used is Newfoundland based T.C. 4 otter trawler for January in Subdivision 3Pn

PREDICTED CATCH RATE

STANDARDS USED VARIABLE NUMBERS: 6 1 1

YEAR	TOTAL CATCH	PROP.	CATCH RATE MEAN	S.E.	EFFORT
1974	66436	0.145	0.638	0.086	104185
1975	60233	0.054	0.447	0.066	134700
1976	76981	0.142	0.515	0.064	149334
1977	73566	0.273	0.503	0.062	146210
1978	78506	0.220	0.556	0.070	141299
1979	82777	0.210	0.571	0.072	145057
1980	97579	0.200	0.630	0.076	154883
1981	97911	0.168	1.167	0.149	83922
1982	104939	0.185	1.233	0.155	85110
1983	106080	0.167	1.030	0.137	102944
1984	103643	0.139	0.967	0.140	107171
1985	86895	0.158	1.106	0.143	78565
1986	79887	0.396	1.033	0.134	77304

AVERAGE C.V. FOR THE MEAN: .130

Table 18: 3Pn, 4RS Cod: average weight (kg) of cod caught per set from research vessel surveys.

TRIP No.	GADUS 4	GADUS 16	GADUS 31	GADUS 46	GADUS 73	GADUS 89	GADUS 104	GADUS 119	GADUS 134
year	1978	1979	1980	1981	1983	1984	1985	1986	1987
Strata									
Div.3Pn									
302	420.63	50.85	143.92	240.03	163.50	125.90	8.00	1010.74	604.33
303	66.00	2.57	74.83	41.25	173.47	59.63	24.50	91.46	170.75
304	11.94	10.23	60.92	33.50	176.40	5.00	39.30	30.33	92.33
305	5.06	3.18	9.50	103.10	6.31	0.50	14.52	7.75	58.87
Div.4R									
801	4.77	48.88	4.75	2.50	83.07	103.00	84.33	21.33	2.25
802	62.14	21.56	351.33	70.50	10.29	13.20	0.90	41.14	42.83
809	103.66	133.63	56.83	122.75	52.77	71.50	91.01	712.43	65.50
810	108.11	34.81	531.00	210.00	81.30	64.75	4.33	125.64	427.62
811	248.48	111.87	619.44	957.00	210.01	2328.86	69.57	753.87	197.58
812	157.62	73.10	8.67	10.50	81.27	352.78	240.00	84.40	2.01
813	86.03	6.24	18.19	3.08	290.63	244.70	156.70	99.15	4.50
820	173.50	135.29	3486.75	1526.78	106.71	123.40	83.50	768.75	52.40
821	2134.63	105.67	182.50	227.25	152.63	462.00	140.10	1743.00	62.61
822	842.44	534.93	3.16	4.40	232.93	495.15	348.35	502.61	0.45
AB	686.51	13.99	1.46	0.00	221.10	498.93	190.75	23.70	
Div.4S									
803	10.43		121.61	45.00	7.61	16.00	12.40	12.03	13.75
804	9.45		19.00	37.33	9.32	15.00	5.17		16.70
807	16.48	5.35	3.47	4.38	84.64	6.17	18.50	10.30	4.64
808	97.22	85.75	166.42	184.00	154.19	454.50	30.92	1404.30	13.77
814	23.74	2.72	4.23	4.10	1064.27	480.07	213.00	2.25	0.33
815	10.43	13.22	11.50	5.13	315.69	803.50	195.84	2.38	8.94
816	10.52	53.57	10.85	0.92	95.34	7.25	58.00		
819	9.89	84.22	2.50	0.75	379.00	305.75	728.93	2.16	3.58
827	2.49		0.13	0.49	160.07	3.86	1.54	0.07	
833	10.13		0.00	0.00	75.00	211.00	26.83		
CD	4.99	244.36	0.87	1.15	196.48	0.81	143.83	0.13	0.86

AB = Strata 823+824

CD = Strata 829+830

Table 19: 3Pn, 4RS Cod: average number of cod caught per set from research vessel surveys.

TRIP No.	GADUS 4	GADUS 16	GADUS 31	GADUS 46	GADUS 73	GADUS 89	GADUS 104	GADUS 119	GADUS 134
Year	1978	1979	1980	1981	1983	1984	1985	1986	1987
Strata									
Div.3Pn									
302	200.33	25.67	57.67	144.27	82.00	71.40	4.23	569.00	256.33
303	28.67	1.33	24.33	31.25	94.00	25.88	12.50	30.89	51.25
304	2.00	5.67	18.00	10.67	108.00	11.00	5.67	14.67	20.33
305	1.80	0.67	2.00	19.60	2.00	2.00	2.33	2.54	8.50
Div.4R									
801	4.67	81.33	14.00	6.00	55.33	55.00	46.00	25.33	2.50
802	19.00	1.50	89.00	22.50	2.57	4.00	0.33	7.43	18.33
809	61.00	64.27	98.33	151.50	27.17	52.60	57.87	430.57	62.67
810	30.33	5.67	262.25	139.58	38.40	22.00	3.00	57.71	585.25
811	199.92	71.20	954.50	631.50	126.00	1850.57	41.86	597.87	220.17
812	134.60	61.60	39.67	29.29	52.00	204.44	185.71	49.20	4.56
813	63.00	40.75	105.00	14.33	188.47	144.80	116.90	140.80	28.00
820	79.25	95.25	2632.75	1008.00	54.86	54.40	35.40	603.50	29.20
821	1359.25	81.25	341.50	340.50	77.57	451.00	71.60	1467.56	53.89
822	551.50	372.00	13.40	13.80	131.30	325.15	221.50	310.67	1.13
AB	556.00	24.20	7.60	0.00	126.00	281.43	214.50	65.40	
Div.4S									
803	5.33		49.86	25.25	2.18	6.53	3.87	7.00	11.00
804	22.33		23.50	70.00	5.40	17.40	4.67		23.80
807	32.00	5.00	12.33	12.00	67.49	12.67	12.17	26.40	5.63
808	48.33	42.40	95.00	160.67	80.88	239.17	17.50	1131.00	17.38
814	44.67	12.00	36.67	16.50	887.33	225.00	156.20	22.50	2.00
815	25.33	21.50	49.67	13.83	205.57	737.00	111.80	9.50	22.22
816	33.60	69.00	33.00	3.86	66.80	21.75	66.75		
819	28.50	79.00	12.00	5.50	276.67	195.50	545.43	10.40	15.17
827	25.00		1.00	14.40	125.50	8.20	4.60	0.67	
833	3.33		0.00	0.00	51.50	147.00	34.67		
CD	23.00	282.50	4.50	5.17	109.33	5.25	139.50	0.75	3.11

AB = Strata 823+824

CD = Strata 829+830

Table 20: 3Pn, 4RS Cod: Research survey numbers at age ('000)

I	1978	1979	1980	1981	1983	1984	1985	1986	1987
1 I	116	58	0	715	0	64	0	0	0
2 I	2032	2983	2397	1594	837	1628	1923	197	224
3 I	7792	4544	20817	5101	9549	6114	10588	4077	3334
4 I	26392	15478	27013	19223	13142	60257	14434	25153	8378
5 I	34007	22817	47728	14729	16703	30097	26893	35443	11358
6 I	43494	15222	37258	29331	49030	45000	14096	65919	4552
7 I	12891	11259	18696	17200	23444	55182	15669	43201	4043
8 I	4467	4977	10649	8114	15284	20221	18217	23629	2202
9 I	1759	1005	4414	2293	6994	14043	7639	13143	1677
10 I	2651	555	816	758	1674	4824	6445	4775	1688
11 I	913	1156	682	75	1236	1730	1382	3122	718
12 I	1087	396	603	220	427	760	899	1162	512
13 I	405	301	505	93	240	397	474	566	165
14 I	270	192	397	245	74	186	100	151	178
15 I	12	109	112	60	107	55	56	86	89
16 I	0	71	70	30	58	126	32	25	12
17 I	0	15	7	11	56	37	5	27	40
18 I	11	0	28	30	0	150	14	0	0
19 I	0	7	14	0	5	31	8	6	0
20 I	11	0	0	15	9	0	0	14	0
21 I	4	14	0	0	0	0	8	0	0
22 I	0	0	0	0	0	30	5	0	0
23 I	0	0	0	0	0	0	6	0	0
1+I	138314	81158	172207	99834	138870	240929	118892	220696	39168
2+I	138198	81100	172207	99119	138870	240865	118892	220696	39168
3+I	136166	78117	169810	97525	138033	239238	116969	220498	38944
4+I	128374	73573	148993	92424	128484	233124	106381	216421	35610
5+I	101982	58095	121979	73202	115342	172867	91947	191268	27231
6+I	67975	35278	74251	58473	98639	142771	65054	155826	15874
7+I	24481	20056	36993	29142	49608	97771	50959	89907	11322

Table 21: 3Pn, 4RS Cod: Recruitment index based on mean number per tow from the research vessel surveys.

Y/C	Mean number per tow 3	4	Normalized 3	4	Recruitment Index
1974		16.34		0.93	0.93
1975	6.38	13.78	1.02	0.79	0.90
1976	4.01	13.74	0.64	0.78	0.71
1977	12.32	9.74	1.96	0.56	1.26
1978	2.61		0.42		0.42
1979		6.99		0.40	0.40
1980	5.33	45.98	0.85	2.62	1.74
1981	4.67	10.81	0.74	0.62	0.68
1982	7.51	21.46	1.20	1.22	1.21
1983	3.67	7.33	0.59	0.42	0.50
1984	2.92		0.47		0.47
Average (75-77),(80-83)	6.27	17.55			

Table 22: 3Pn, 4RS Cod: F-ratio (F-F[7-10])

	I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	I	.192	.154	.104	.049	.044	.047	.067	.096	.073	.165	.060	.087	.075
5	I	.778	.599	.459	.214	.328	.295	.331	.285	.345	.674	.258	.486	.341
6	I	.868	.803	.563	.613	.725	.584	.682	.712	.565	.709	.705	.763	.662
7	I	.890	.940	.855	1.101	1.077	.939	.984	1.044	.793	1.048	.977	1.094	1.000
8	I	1.085	1.019	1.028	.822	.801	1.185	1.124	.946	1.247	.816	1.018	.985	1.000
9	I	.988	.965	.942	1.004	.808	.993	.798	.822	1.276	1.237	.992	.912	1.000
10	I	1.105	1.370	1.314	.827	1.062	1.043	.648	1.142	1.573	1.245	1.221	.828	1.000
11	I	.876	1.221	1.233	.804	1.043	.901	.863	.830	1.585	2.111	1.289	1.124	1.000
12	I	.947	1.508	.917	.848	1.002	1.236	1.143	1.249	.662	1.801	2.070	.694	1.000
13	I	.608	1.752	1.088	1.181	1.431	.571	.657	1.621	1.042	3.117	2.490	1.253	1.000
14	I	.584	1.365	1.676	1.120	1.788	1.281	.528	1.538	.841	1.182	1.175	.732	1.000
15	I	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 23: 3Pn, 4RS Cod: Partial recruitment

	I	4	5	6	7	8	9	10	11	12	13	14	15
	I	.075	.341	.662	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 24: 3Pn, 4RS Cod: Mobile gear partial recruitment

	I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	I	.076	.238	.204	.067	.052	.043	.033	.112	.066	.117	.044	.106	.080
5	I	.485	.926	.883	.271	.483	.316	.298	.428	.408	.677	.226	.568	.393
6	I	.794	1.000	.943	.724	1.000	.718	.774	1.000	.578	.719	.761	.811	.747
7	I	.889	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.857	1.000	1.000	1.000	1.000
8	I	1.000	.883	1.000	.807	.803	1.000	1.000	1.000	1.000	.808	1.000	1.000	.939
9	I	.953	.923	.741	1.000	.706	.783	.644	.644	.950	1.000	.928	.858	.929
10	I	1.000	1.000	1.000	.984	1.000	.552	.633	.684	.724	.656	.908	.746	.822
11	I	.553	.502	1.000	.906	1.000	.769	.753	.194	.383	.979	.798	.779	.845
12	I	.936	.971	.782	.874	1.000	.824	1.000	.451	.487	.491	1.000	.379	.599
13	I	.621	1.000	.710	1.000	1.000	.330	.737	.237	.266	.505	1.000	.403	.829
14	I	.396	.522	.725	1.000	1.000	.888	.793	.214	.303	.267	.674	.112	.316
15	I	.963	.988	.402	.074	1.000	.462	.962	.497	.831	.281	.611	.142	.623

Table 25: 3Pn, 4RS Cod: Results of the calibrations.

A) 4+ Mean trawlable biomass Versus standardized CPUE.

	Terminal F for 1986					
	0.2	0.25	0.275	0.3	0.35	0.4
Correlation	0.814	0.827	0.828	0.825	0.806	0.769
Origin	13800	46000	57800	67500	82800	94300
Slope	295000	228000	203000	183000	151000	127000
S.S.R. *	1.3E+10	4.1E+09	2.3E+09	1.3E+09	7.0E+08	1.1E+09

B) 4+ Mean trawlable biomass Versus standardized CPUE (1981 & 1982 data points removed).

	Terminal F for 1986					
	0.2	0.25	0.275	0.3	0.35	0.4
Correlation	0.962	0.945	0.93	0.911	0.857	0.785
Origin	-73700	-13400	8560	26700	55400	76800
Slope	439000	326000	284000	250000	196000	156000
S.S.R. *	5.4E+08	2.3E+08	3.9E+08	6.3E+08	1.2E+09	1.8E+09

* Sum of squares of the residuals for the years 1984 to 1986.

Table 26: 3Pn, 4RS Cod: Population numbers ('000) 4/ 6/87

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4 I	57199	86882	113198	98269	135395	161065	117632	202416	124993	129821	170509	120283	125878
5 I	37560	43149	67230	87965	78038	108429	128789	93241	159672	99412	101854	136934	96274
6 I	48133	22059	28354	43702	62859	54126	76111	89595	68196	113734	67588	76393	98335
7 I	18544	27194	13453	17493	24238	35525	32668	44040	55208	44300	76422	43127	50579
8 I	19834	10384	15763	7175	7135	11437	17692	16228	23415	32743	27036	44250	25929
9 I	8951	10215	5851	7703	3496	3885	5000	8093	9007	11323	21377	15444	27471
10 I	4427	4800	5869	2989	3344	1900	1887	2709	4678	4323	6501	12355	9796
11 I	1459	2259	2374	2487	1454	1597	903	1108	1368	1922	2489	3426	8028
12 I	573	822	1180	1045	1228	703	816	478	641	561	834	1294	2042
13 I	403	313	387	609	499	606	304	375	235	394	268	316	874
14 I	159	256	134	183	236	197	369	179	159	125	129	88	181
15 I	72	102	129	47	74	77	82	231	80	93	74	69	59
4+I	197314	208435	253922	269667	317996	379547	382253	458693	447652	438751	475081	453979	445446
5+I	140115	121553	140724	171398	182601	218482	264621	256277	322659	308930	304572	333696	319568
6+I	102555	78404	73494	83433	104563	110053	135832	163036	162987	209518	202718	196762	223294
7+I	54422	56345	45140	39731	41704	55927	59721	73441	94791	95784	135130	120369	124959

Table 27: 3Pn, 4RS Cod: Mean biomass (t) 4/ 6/87

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4 I	31912	54934	76057	57011	91391	93367	65080	141753	94587	107418	120743	83913	82993
5 I	28781	35367	61854	76406	62994	85354	99997	78485	150085	107222	90962	114124	82387
6 I	48135	26374	37681	48727	68792	60508	84067	94087	79800	150540	78966	76999	98554
7 I	23551	39695	21473	23291	33695	47748	44909	60406	75887	66314	104361	54941	59835
8 I	28738	18464	29222	12896	14050	20110	29610	30563	35345	58070	42084	68410	40196
9 I	16708	20434	12348	14484	8417	9413	12763	20817	16981	21320	37845	27095	48741
10 I	9308	10612	12268	6750	7845	5146	6077	8923	9710	11532	12984	23743	19451
11 I	4950	6909	6337	5976	3323	4606	2945	5155	3511	5885	6365	7107	16272
12 I	2402	2596	4168	3125	3400	2487	2197	2543	2892	1732	2002	4080	4845
13 I	1804	907	1882	1625	1663	2570	1281	1493	1051	1578	760	1151	2226
14 I	849	1215	438	541	839	703	1229	978	788	578	754	541	769
15 I	461	512	694	258	390	344	463	923	363	493	469	467	295
4+I	197598	218019	264422	251090	296799	332355	350618	446126	471000	532684	498294	462571	456564
5+I	165686	163084	188366	194080	205408	238988	285538	304373	376413	425266	377552	378658	373571
6+I	136905	127717	126512	117674	142414	153634	185542	225888	226328	318044	286589	264534	291184
7+I	88770	101344	88831	68946	73622	93126	101475	131801	146528	167504	207624	187535	192630

Table 28: 3Pn, 4RS Cod: Fishing mortality 4/ 6/87

I	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4 I	.082	.056	.052	.031	.022	.024	.032	.037	.029	.043	.019	.023	.021
5 I	.332	.220	.231	.136	.166	.154	.163	.113	.139	.186	.088	.131	.094
6 I	.371	.294	.283	.389	.371	.305	.347	.284	.231	.198	.249	.212	.182
7 I	.380	.345	.429	.697	.551	.497	.500	.432	.322	.294	.346	.309	.275
8 I	.464	.374	.516	.519	.408	.627	.582	.389	.527	.226	.360	.277	.275
9 I	.423	.354	.472	.634	.410	.522	.413	.348	.534	.355	.348	.255	.275
10 I	.473	.504	.658	.521	.539	.544	.332	.483	.690	.352	.440	.231	.275
11 I	.375	.449	.620	.506	.526	.471	.436	.347	.692	.634	.454	.318	.275
12 I	.406	.554	.462	.539	.506	.638	.579	.508	.287	.539	.771	.192	.275
13 I	.254	.646	.546	.750	.732	.296	.327	.655	.430	.919	.912	.356	.275
14 I	.242	.484	.847	.707	.913	.678	.267	.610	.342	.329	.426	.203	.275
15 I	.422	.353	.474	.640	.505	.527	.517	.411	.394	.276	.350	.287	.275

Table 29: 3Pn, 4RS Cod: Projections of population abundance, biomass and catch biomass assuming a catch of 80,300 t (the TAC) in 1987 and F0.1 = 0.2 in 1988 for a terminal fishing mortality of 0.275 in 1986

POPULATION BIOMASS

	1986	1987	1988
4	86659	83391	83526
5	83259	87648	85077
6	105876	77912	83547
7	65547	88188	66899
8	40758	50133	69997
9	48930	29122	37174
10	19663	34771	21476
11	18505	14238	26129
12	5711	14158	11305
13	2932	4320	11113
14	993	3023	4622
15	362	700	2213
4+	479195	487604	503079
5+	392536	404213	419553
6+	309277	316566	334476
7+	203402	238654	250929

POPULATION NUMBERS

	1986	1987	1988
4	125878	121000	121000
5	96274	100957	97263
6	98335	71759	75865
7	50579	67113	49858
8	25929	31454	43009
9	27471	16125	20157
10	9796	17084	10333
11	8028	6092	10948
12	2042	4993	3904
13	874	1270	3199
14	181	543	814
15	59	112	348
4+	445446	438502	436698
5+	319568	317502	315698
6+	223294	216545	218435
7+	124959	144786	142571

CATCH BIOMASS

	1986	1987	1988
4	1787	1532	1253
5	7817	7515	5955
6	19270	12788	11195
7	18025	21604	13380
8	11208	12282	13999
9	13456	7134	7435
10	5403	8513	4295
11	5089	3488	5226
12	1570	3468	2261
13	807	1058	2223
14	274	741	924
15	99	172	443
4+	34809	80300	68589
5+	83022	78768	67336
6+	75206	71253	61381
7+	55936	58465	50186

FISHING MORTALITY

	1986	1987	1988
4	.021	.018	.015
5	.094	.086	.070
6	.182	.164	.134
7	.275	.245	.200
8	.275	.245	.200
9	.275	.245	.200
10	.275	.245	.200
11	.275	.245	.200
12	.275	.245	.200
13	.275	.245	.200
14	.276	.245	.200
15	.274	.245	.200
4+	.143	.133	.108

Table 30: 3Pn, 4RS Cod projections of population abundance, biomass and catch biomass assuming F0.1 = 0.1 exploitation rate in 1987 and 1988 for a terminal fishing mortality of 0.275 in 1986

POPULATION NUMBERS

	1986	1987	1988
4	125878	121000	121000
5	96274	100957	97592
6	98335	71759	77201
7	50579	67113	51467
8	25929	31454	44987
9	27471	16125	21084
10	9796	17084	10809
11	8028	6092	11452
12	2042	4993	4084
13	874	1270	3347
14	181	543	851
15	59	112	364
4+1	445446	438502	444238
5+1	319568	317502	323238
6+1	223294	216545	225646
7+1	124959	144786	148445

POPULATION BIOMASS (AVERAGE)

	1986	1987	1988
4	86659	83527	83527
5	83259	88381	85435
6	105876	79087	85085
7	65547	90052	69059
8	40758	51193	73217
9	48930	29737	38884
10	19663	35506	22464
11	18505	14539	27331
12	5711	14457	11825
13	2932	4411	11624
14	993	3087	4835
15	362	715	2315
4+1	479195	494690	515600
5+1	392536	411164	432074
6+1	309277	322783	346639
7+1	203402	243696	261555

CATCH BIOMASS

	1986	1987	1988
4	1787	1253	1253
5	7817	6034	5833
6	19270	10468	11262
7	18025	18010	13812
8	11208	10239	14643
9	13456	5947	7777
10	5408	7101	4493
11	5089	2908	5466
12	1570	2891	2365
13	807	882	2325
14	274	617	967
15	99	143	463
4+1	84809	66495	70659
5+1	83022	65242	69407
6+1	75206	59208	63573
7+1	55936	48739	52311

FISHING MORTALITY

	1986	1987	1988
4	.021	.015	.015
5	.094	.068	.068
6	.182	.132	.132
7	.275	.200	.200
8	.275	.200	.200
9	.275	.200	.200
10	.275	.200	.200
11	.275	.200	.200
12	.275	.200	.200
13	.275	.200	.200
14	.276	.200	.200
15	.274	.200	.200
4+1	.143	.108	.109

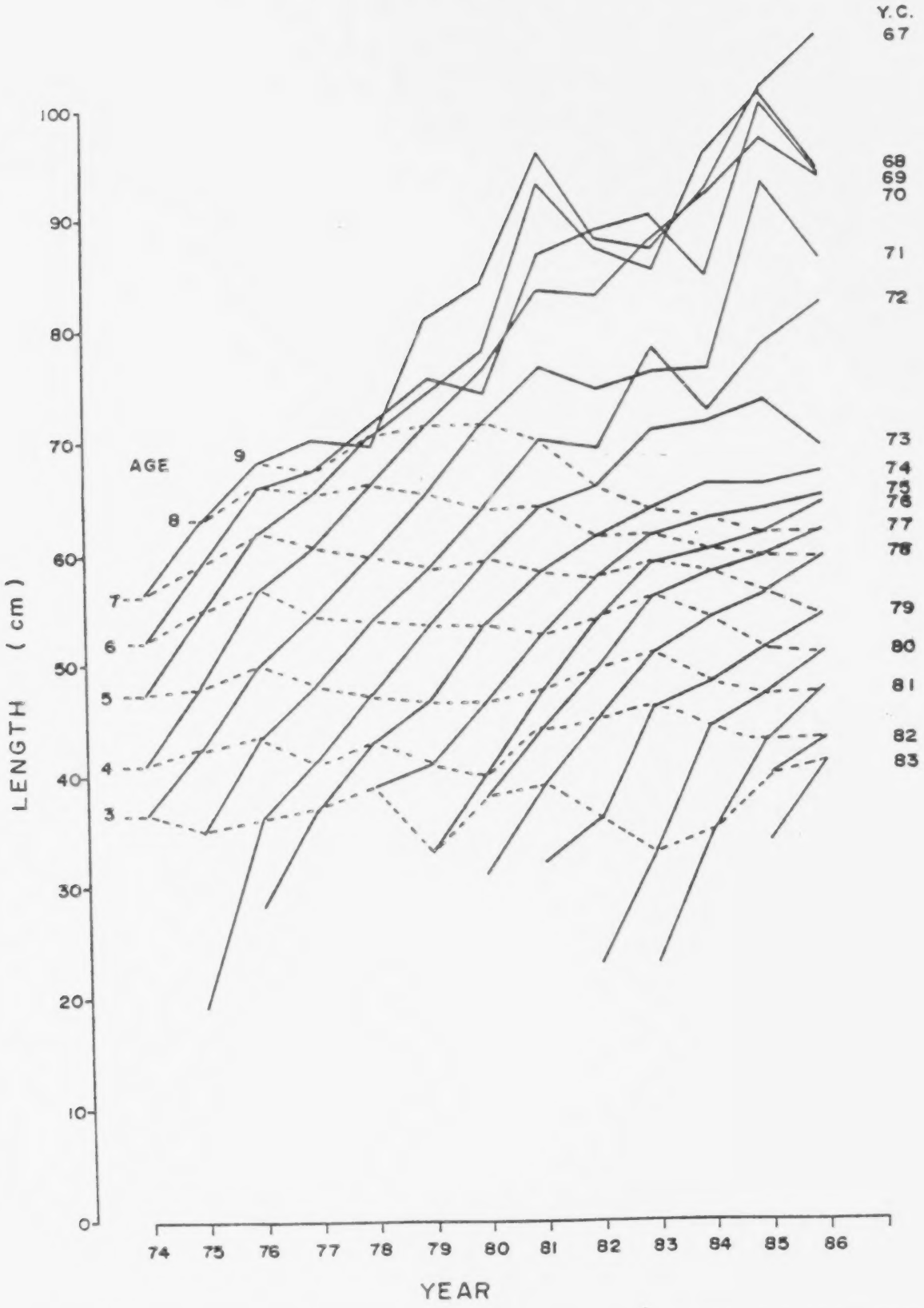


FIGURE 1 : 3Pn, 4RS COD CHANGES IN AVERAGE LENGTH AT AGE FROM THE COMMERCIAL FISHERY SAMPLING

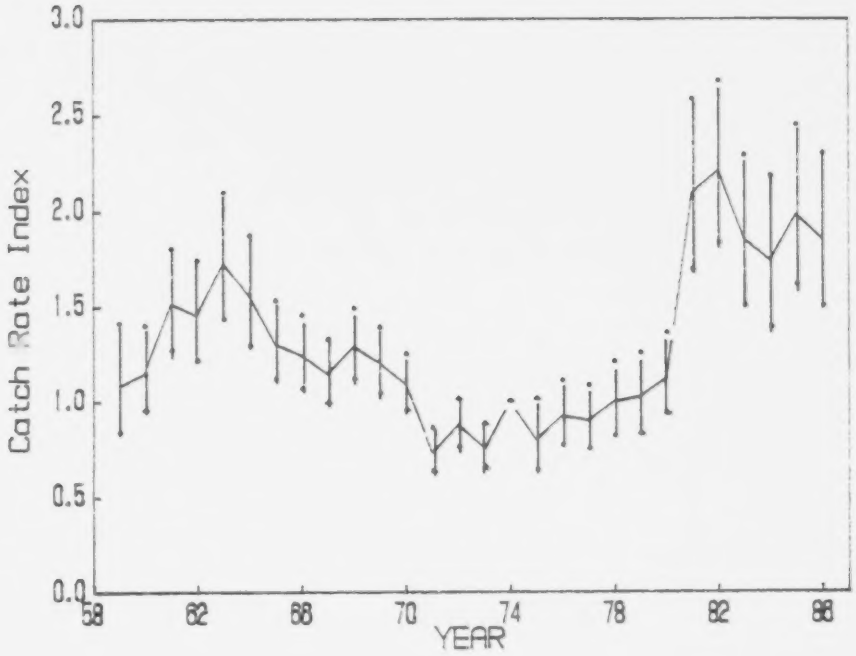


FIGURE 2: 3Pn, 4RS COD HISTORICAL CATCH RATE INDEX
(RELATIVE TO 1974)

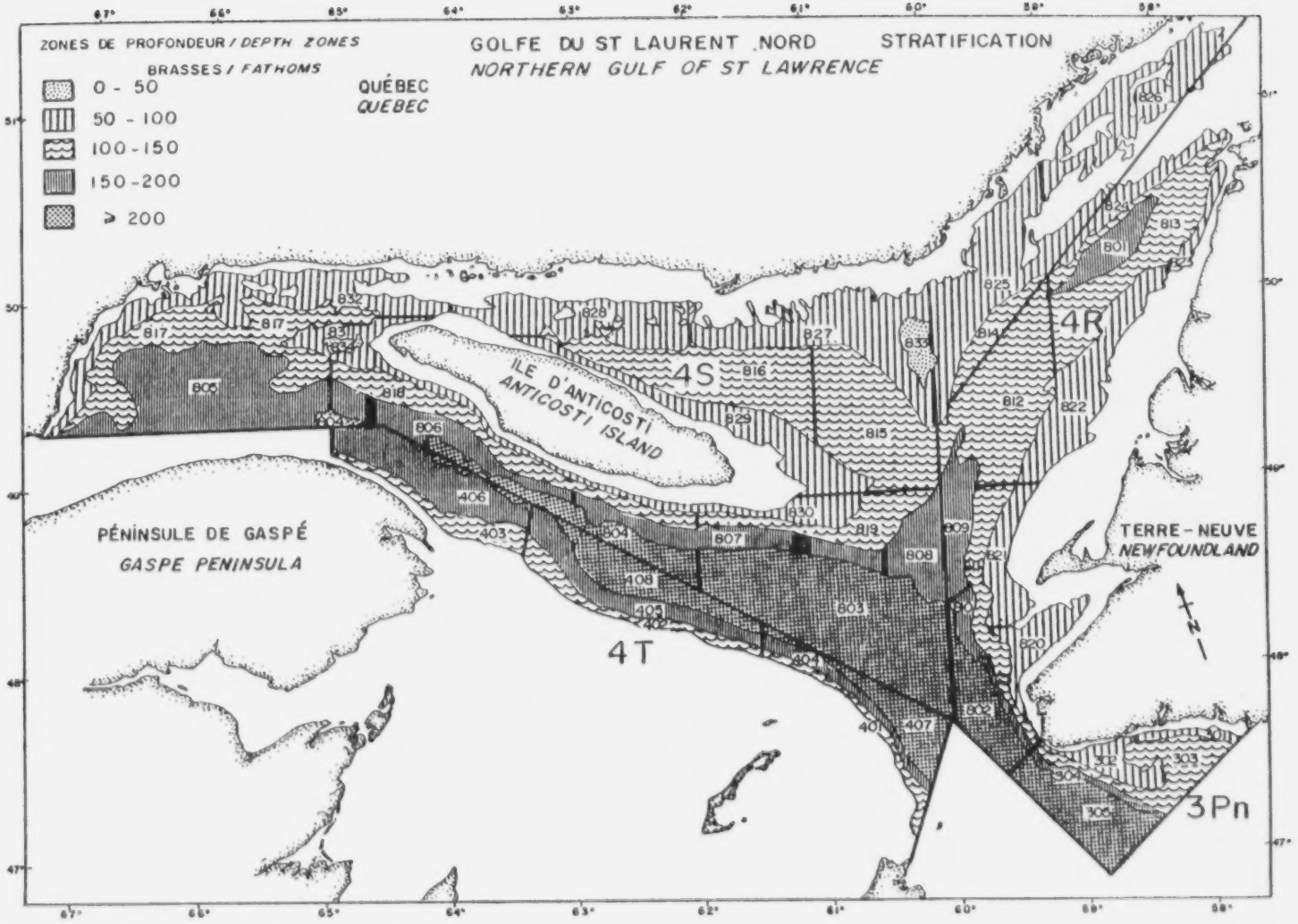


FIGURE 3: 3Pn, 4RS COD STRATIFICATION SCHEME USED FOR GROUNDFISH SURVEYS

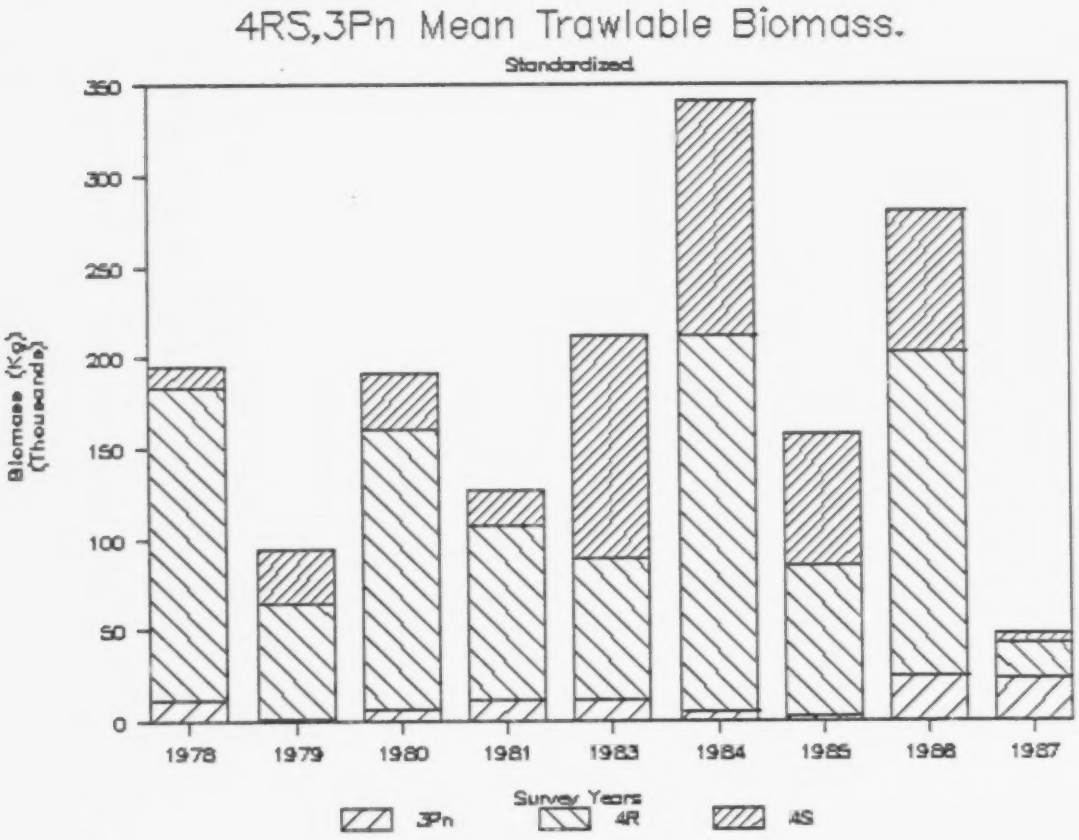


FIGURE 4: 3Pn, 4RS COD MEAN TRAWLABLE BIOMASS ESTIMATED BY RANDOM STRATIFIED SURVEYS ON THE GADUS ATLANTICA

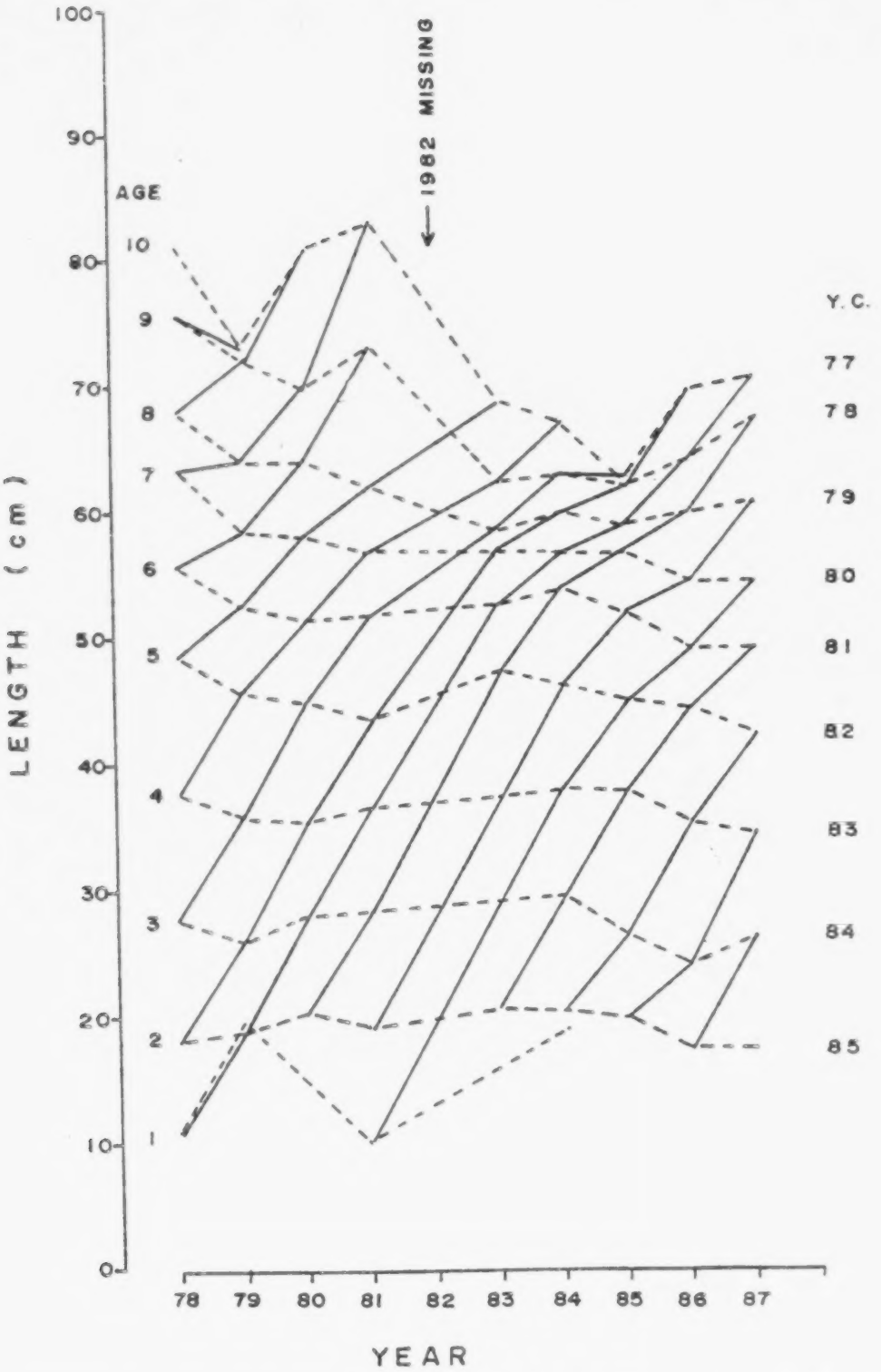


FIGURE 5: 3Pn, 4RS COD CHANGES IN AVERAGE LENGTH AT AGE FROM THE RESEARCH VESSEL SURVEYS

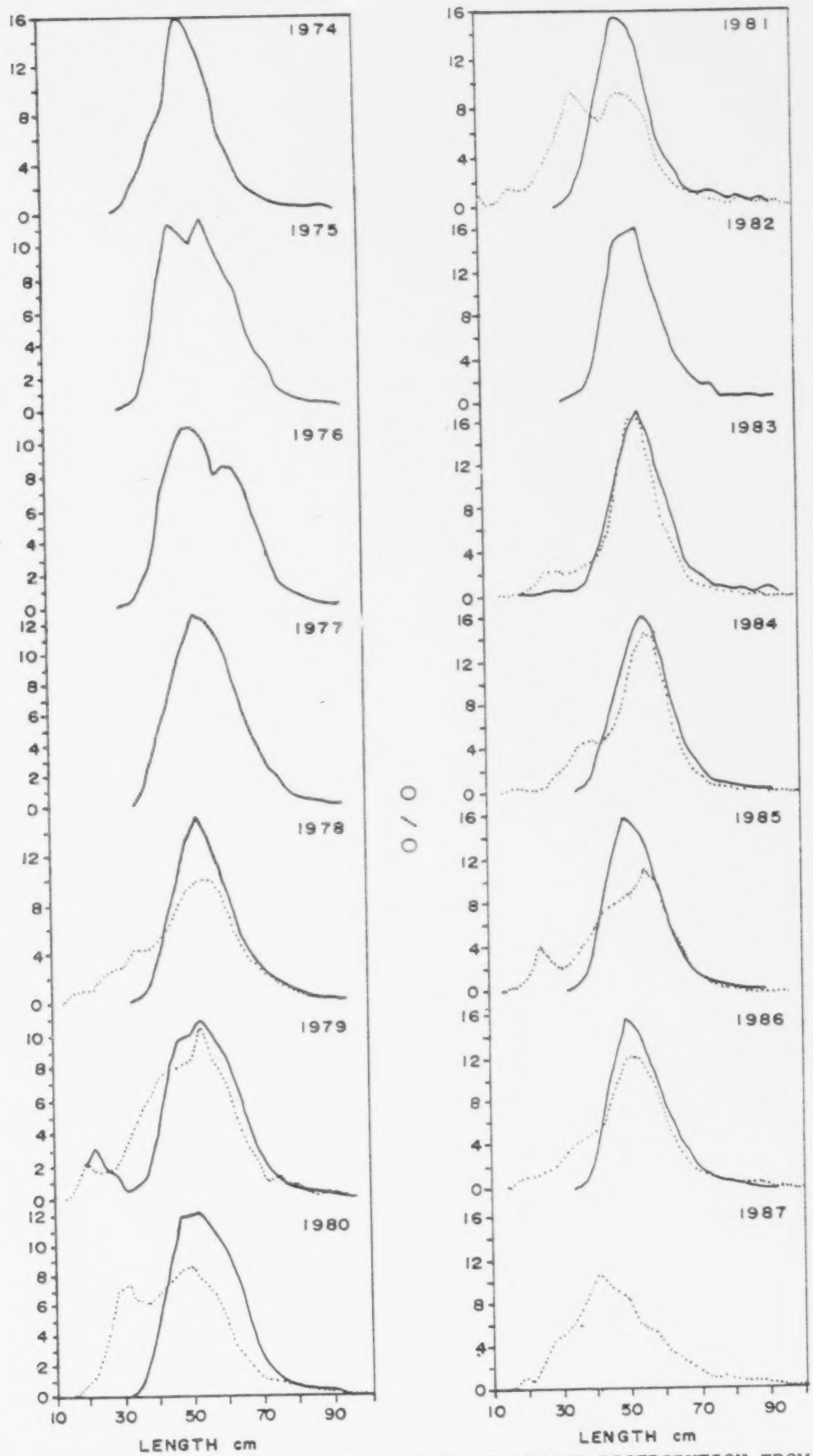


FIGURE 6: 3Pn, 4RS COD COMPARISON OF LENGTH DISTRIBUTION FROM THE COMMERCIAL SAMPLING (SOLID LINE) TO THE RESEARCH VESSEL SURVEYS (DOTTED LINE)

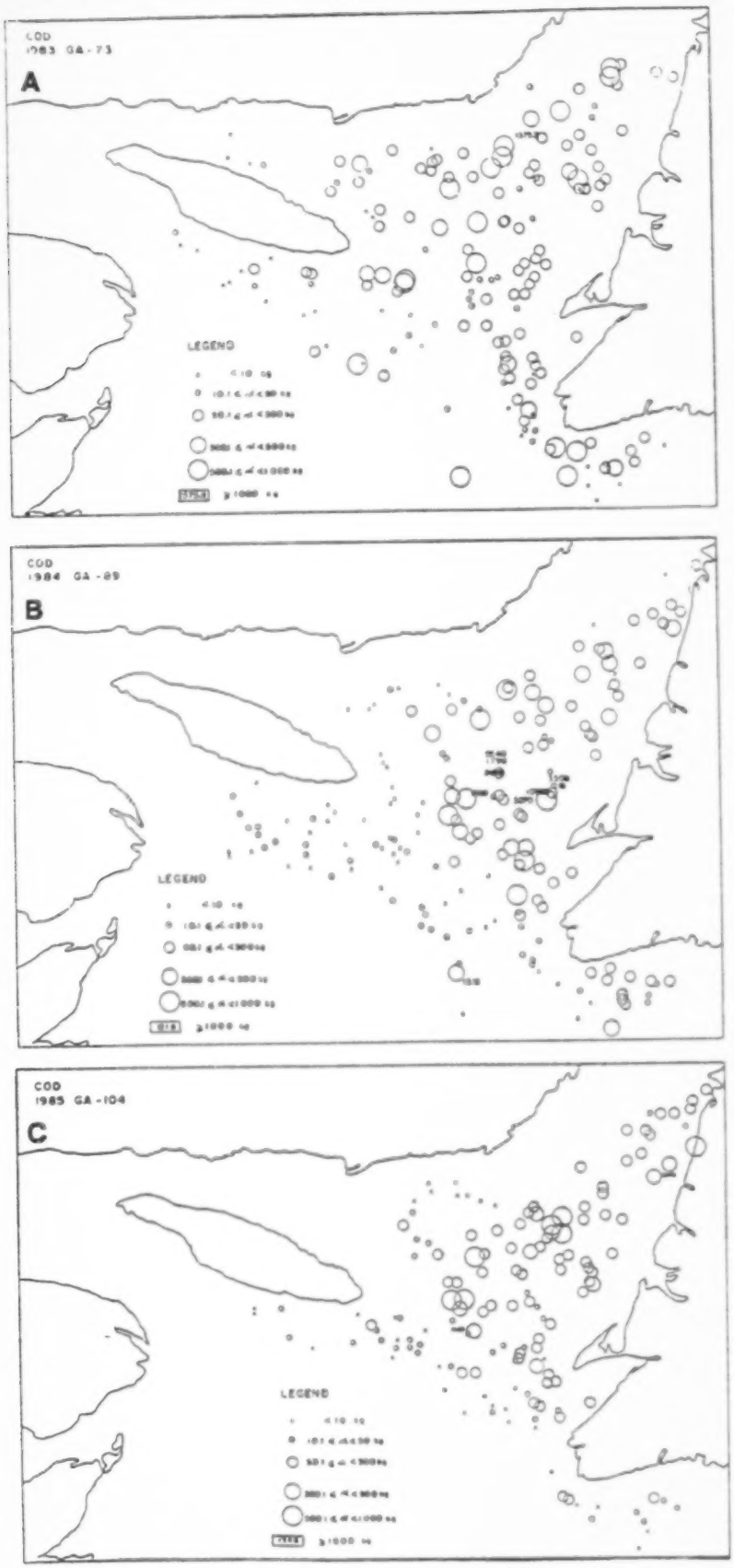
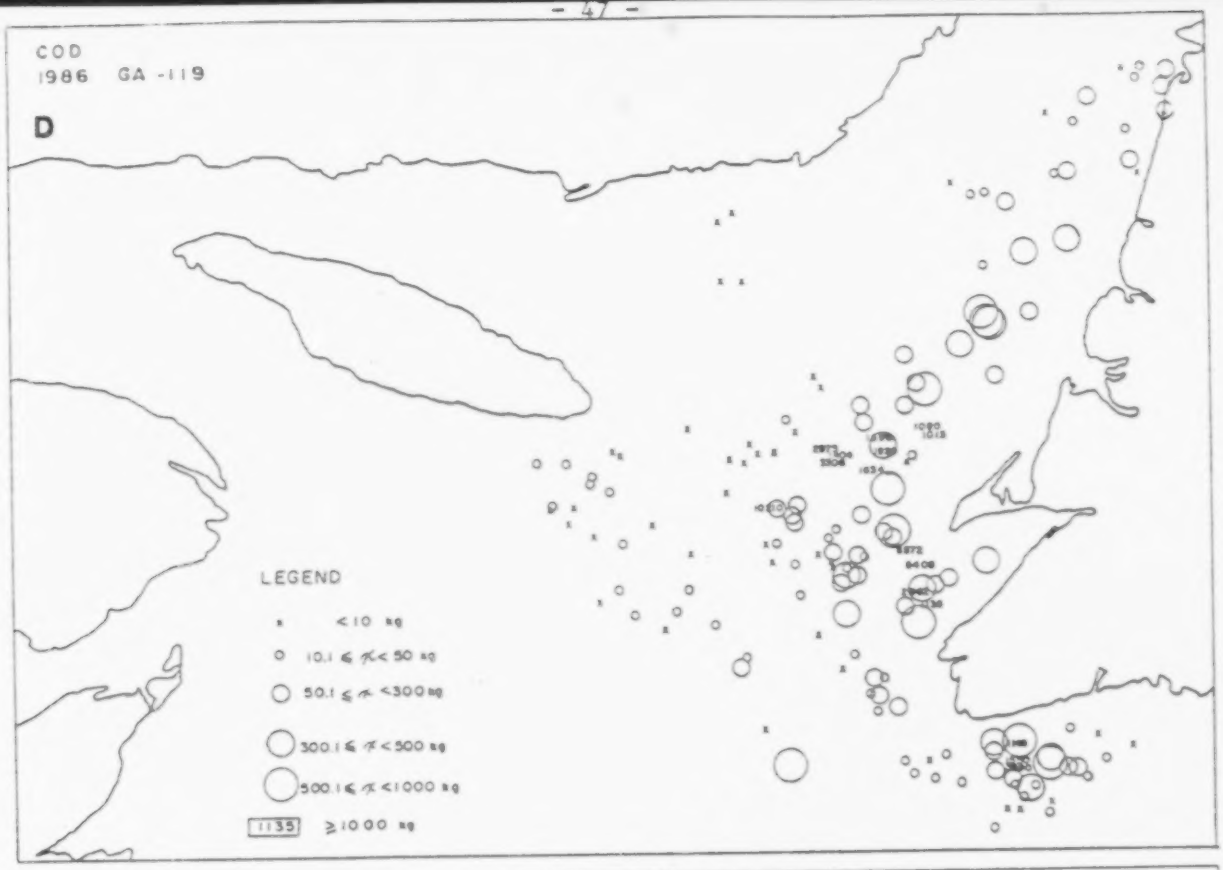


Figure 7: Distribution and catch rate (kg/30 min. tow) of cod in research surveys on the Gadus Atlantica from 1983 (a) to 1987 (e)



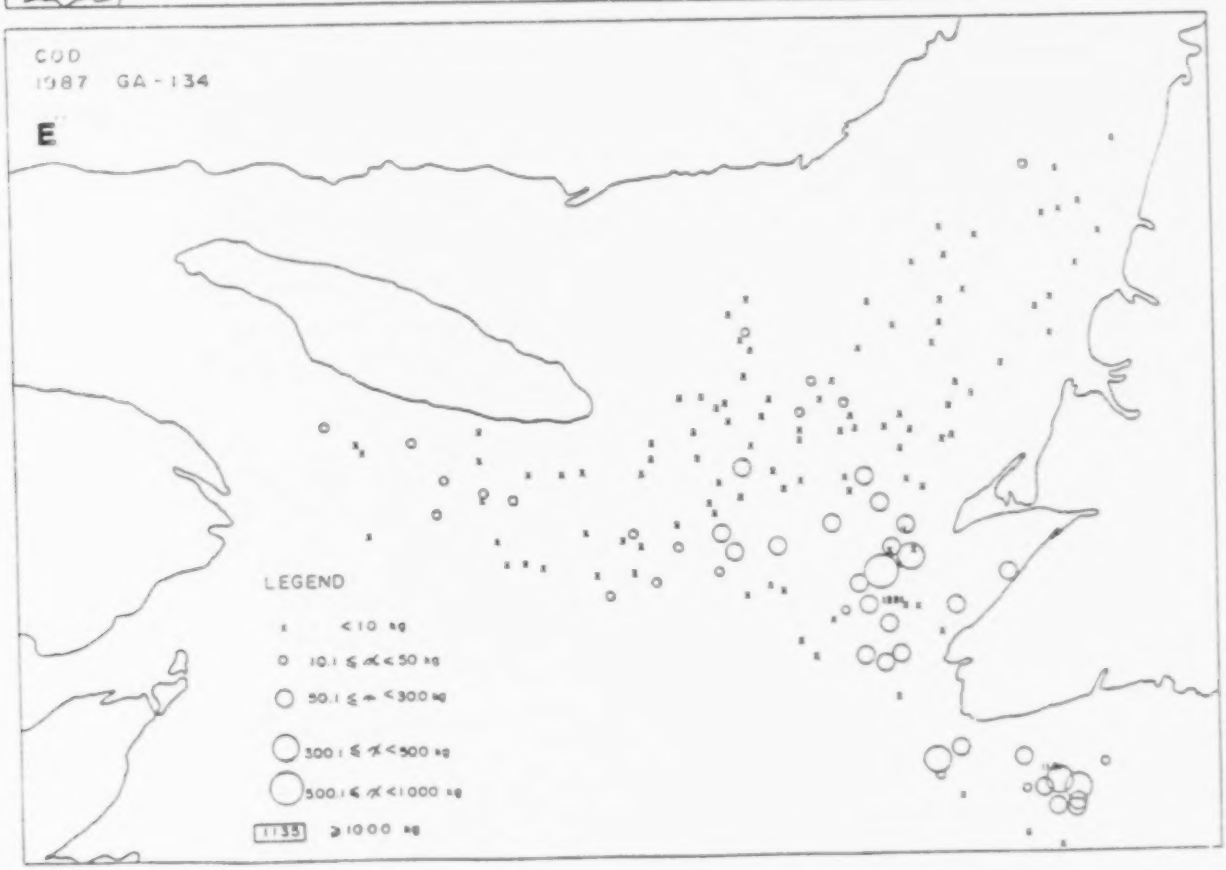


Figure 7 (continued)

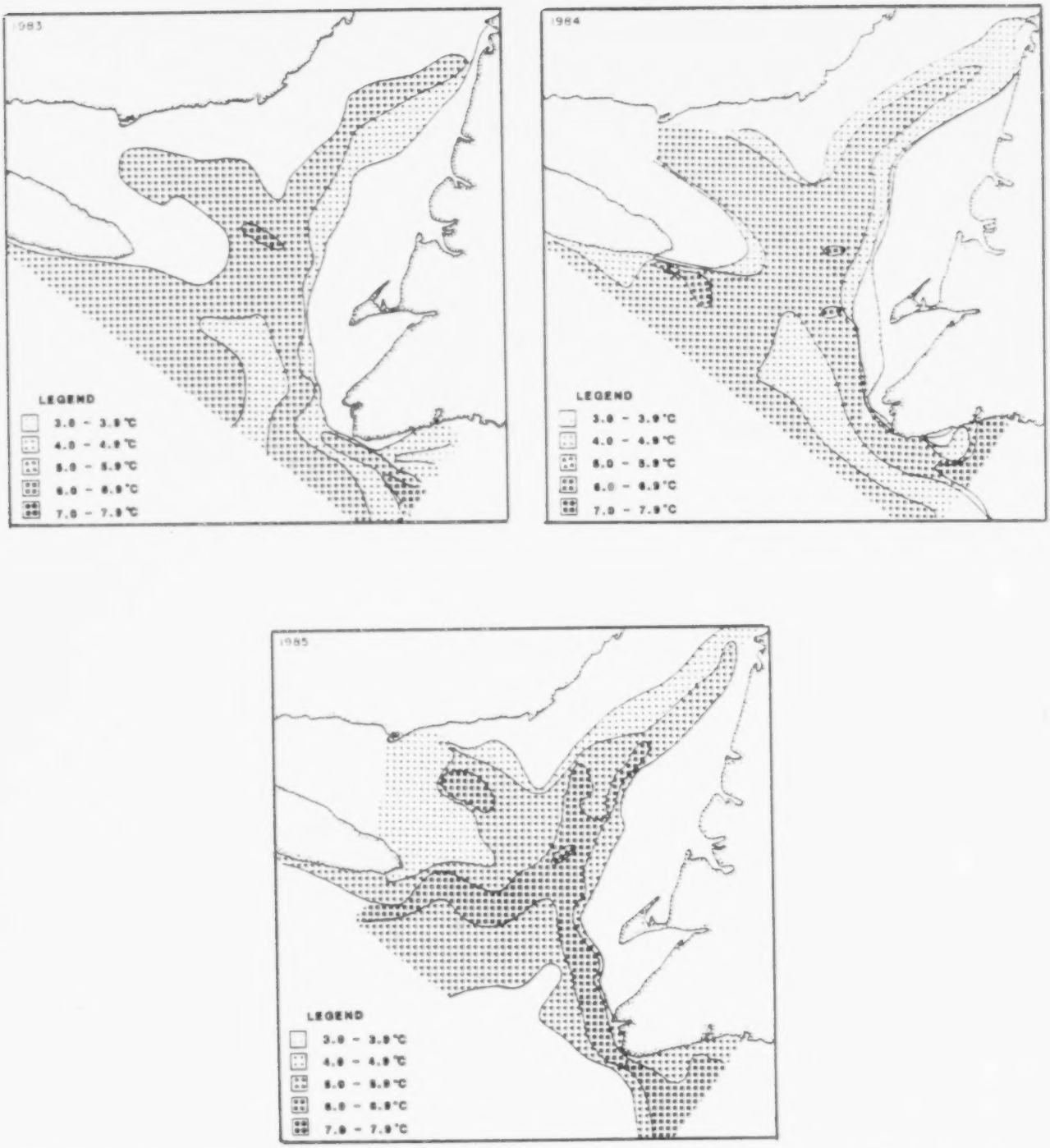
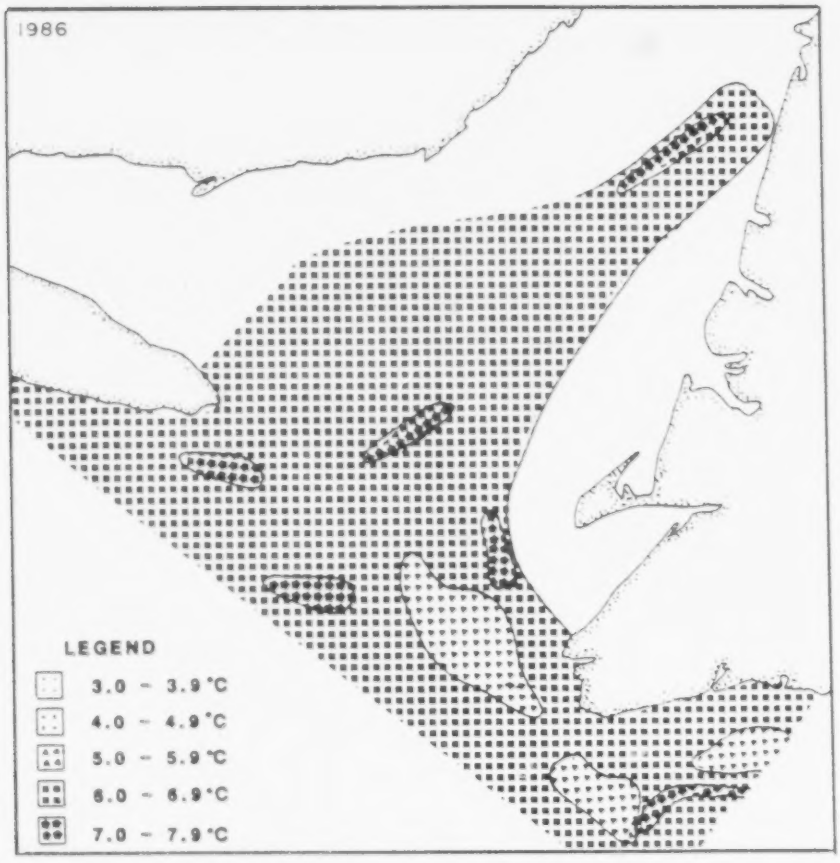


FIGURE 8: 3Pn, 4RS COD MAPS ILLUSTRATING OBSERVED BOTTOM TEMPERATURES DURING THE WINTER GROUNDFISH SURVEYS



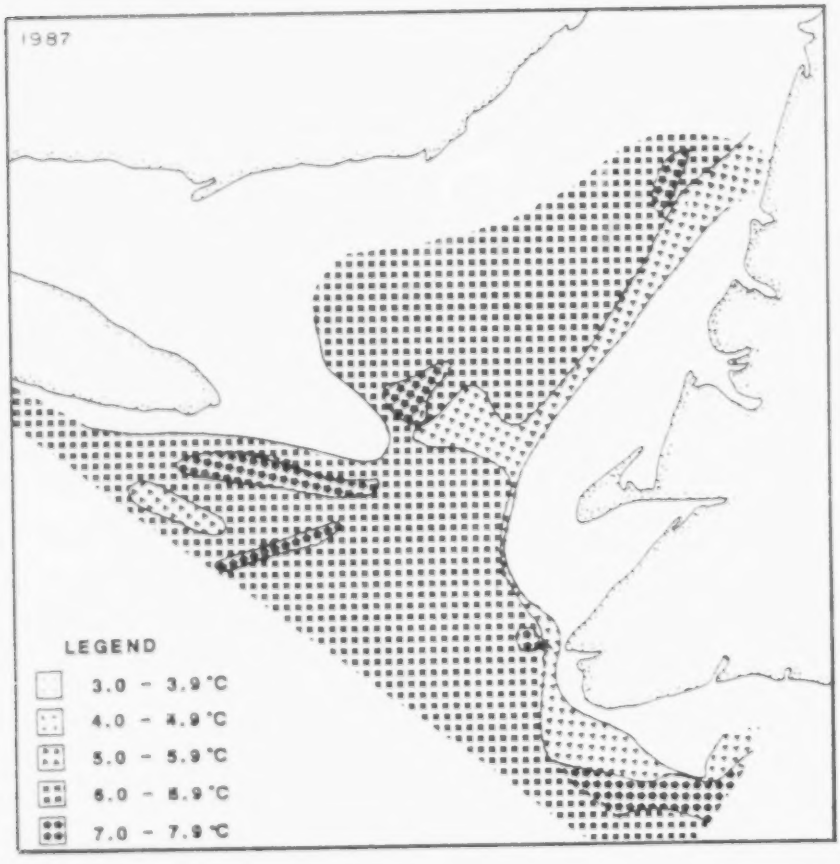


FIGURE 8 (Continued)

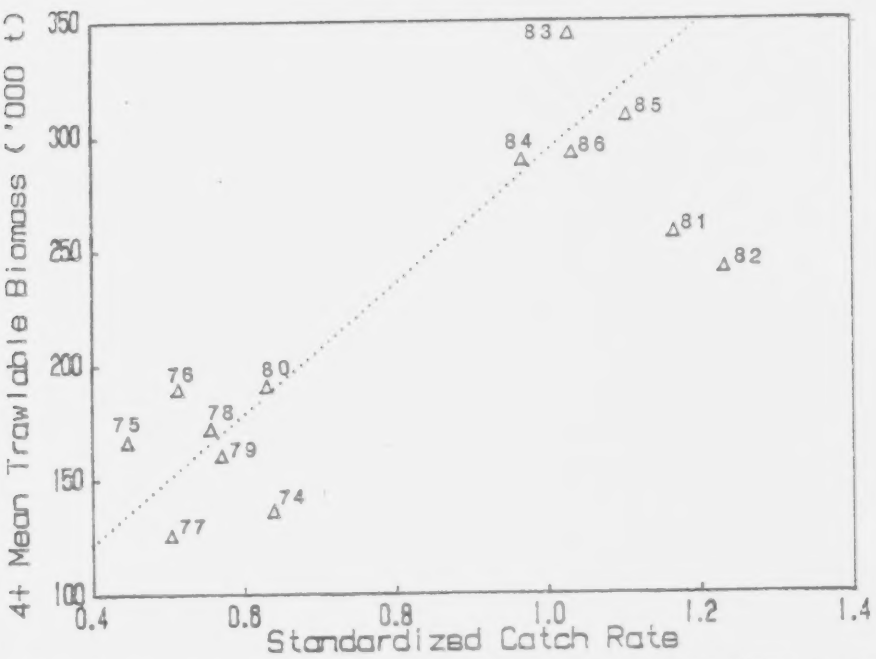


FIGURE 9: 3Pn, 4RS COD CALIBRATION PLOT OF ESTIMATED 4t MEAN TRAWLABLE BIOMASS VERSUS STANDARDIZED CATCH RATE. REGRESSION LINE EXCLUDES THE 1981 AND 1982 DATAPOINTS

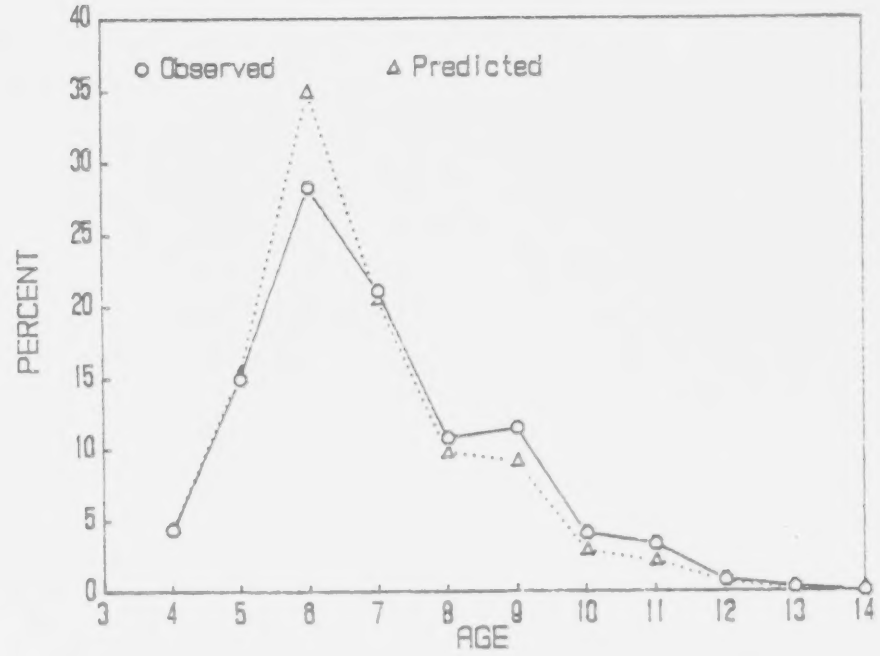


FIGURE 10: COMPARISON BETWEEN PROJECTED 1986 CATCH AT AGE (FRECHET, 1986) TO THE OBSERVED CATCH AT AGE